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Desilets et al.

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[45] **Date of Patent: Dec. 1, 1998**

[54] **POWER AND FREE CONVEYOR SYSTEM UTILIZING POWER TRACK AND DOG ELEVATION TO PREVENT JAMMING CONDITIONS AT TRANSFERS AND SWITCHES**

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[73] Assignee: **Ford Motor Company**, Dearborn, Mich.

[21] Appl. No.: **682,689**

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PCT Pub. Date: **Oct. 10, 1996**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 418,214, Apr. 6, 1995, Pat. No. 5,606,915.

[51] **Int. Cl.**[6] **B61B 3/00**

[52] **U.S. Cl.** **104/172.4**; 104/130; 104/250; 104/252

[58] **Field of Search** 104/172.4, 172.1, 104/172.3, 130.7, 130.01, 250, 252, 249

[56] **References Cited**

U.S. PATENT DOCUMENTS

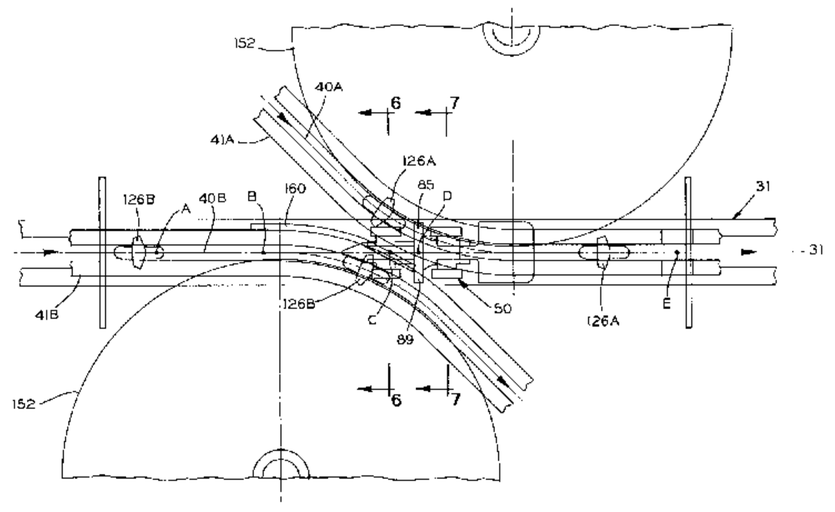
3,742,861	7/1973	Wilkinson	104/172.4
3,995,561	12/1976	Allor	104/172.4
4,058,064	11/1977	Wilder et al. .	
4,073,236	2/1978	Harrington .	
4,073,238	2/1978	Knudsen .	
4,114,538	9/1978	Nicodemus, Jr. et al. .	
4,223,610	9/1980	Lempio	104/172.4
4,326,466	4/1982	Parry et al.	104/172.4
4,408,539	10/1983	Wakabayashi .	
4,408,540	10/1983	Dehne .	
4,456,117	6/1984	Szczepanski .	
4,461,216	7/1984	Carney .	
4,462,315	7/1984	Wakabayashi .	
4,542,698	9/1985	Wakabayashi	104/172.4
4,614,158	9/1986	Helde .	
4,616,570	10/1986	Dehne	104/172.3
4,641,583	2/1987	Harrington .	
4,669,388	6/1987	Dehne et al. .	
4,771,700	9/1988	Wakabayashi	104/172.4
4,885,997	12/1989	Wakahayashi .	
4,939,999	7/1990	Burt et al. .	
5,058,508	10/1991	Kavieff et al. .	
5,507,233	4/1996	Kwon et al.	104/172.4
5,606,915	3/1997	Harris	104/172.4

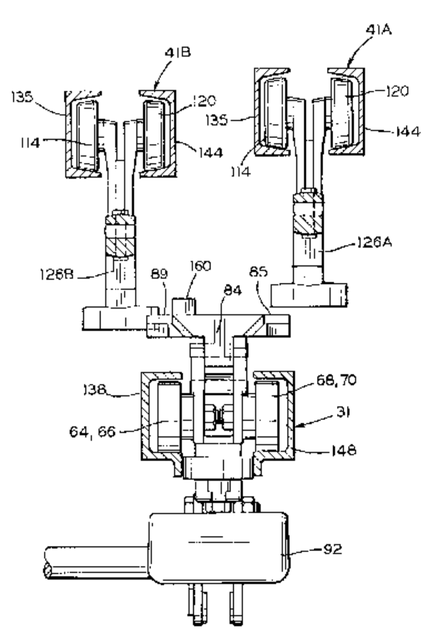
Primary Examiner—Mark Tuan Le
Attorney, Agent, or Firm—Marshall & Melhorn

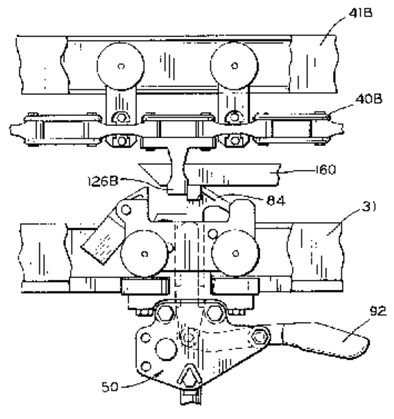
[57] **ABSTRACT**

A power and free conveyor system is provided which utilizes a difference in height between the wipe in power trolley and the wipe out power trolley, with or without a camming down of a retractable wide dog of the free trolley, to allow the wipe in power chain to wipe in over the retractable dog without any possibility of lateral interference. Thereafter the elevation of the wipe in power trolley and the wipe out power trolley are the same. Improved stop device operating to push down the retractable dog and therefore cause disengagement of the retractable dog from the power chain dog are also provided.

76 Claims, 14 Drawing Sheets







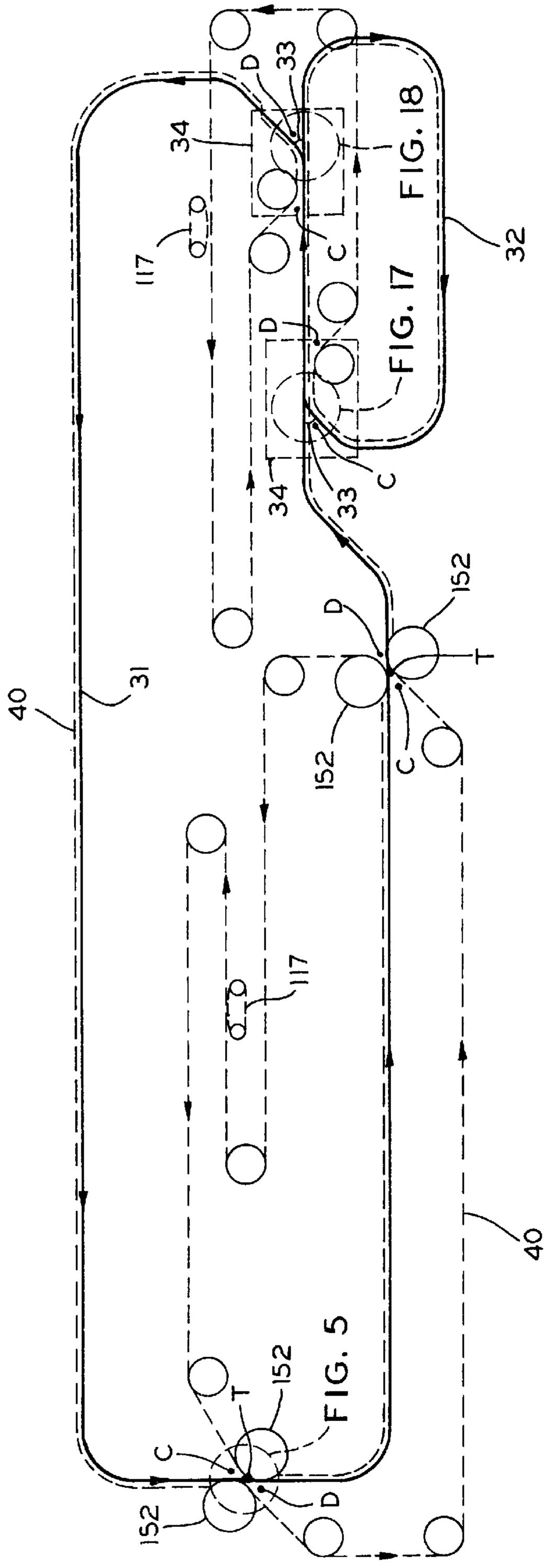

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FIG. 18
FIG. 17
FIG. 16
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FIG. 5

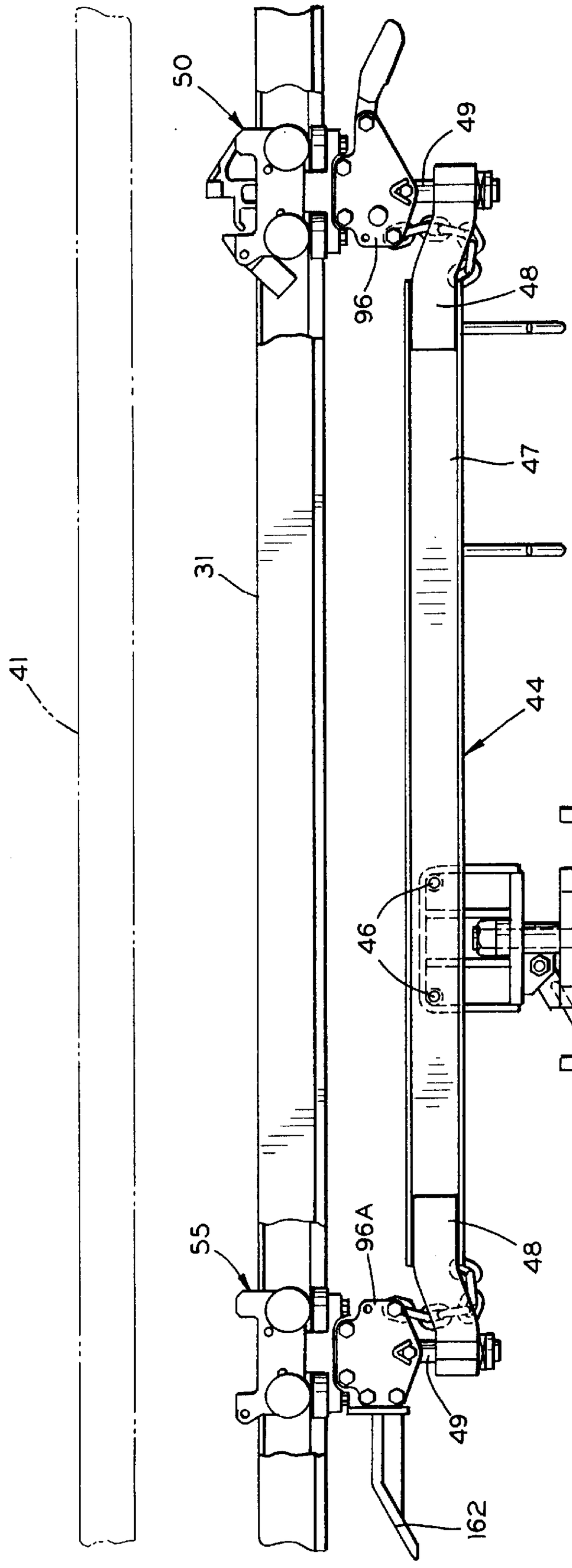

FIG. 2

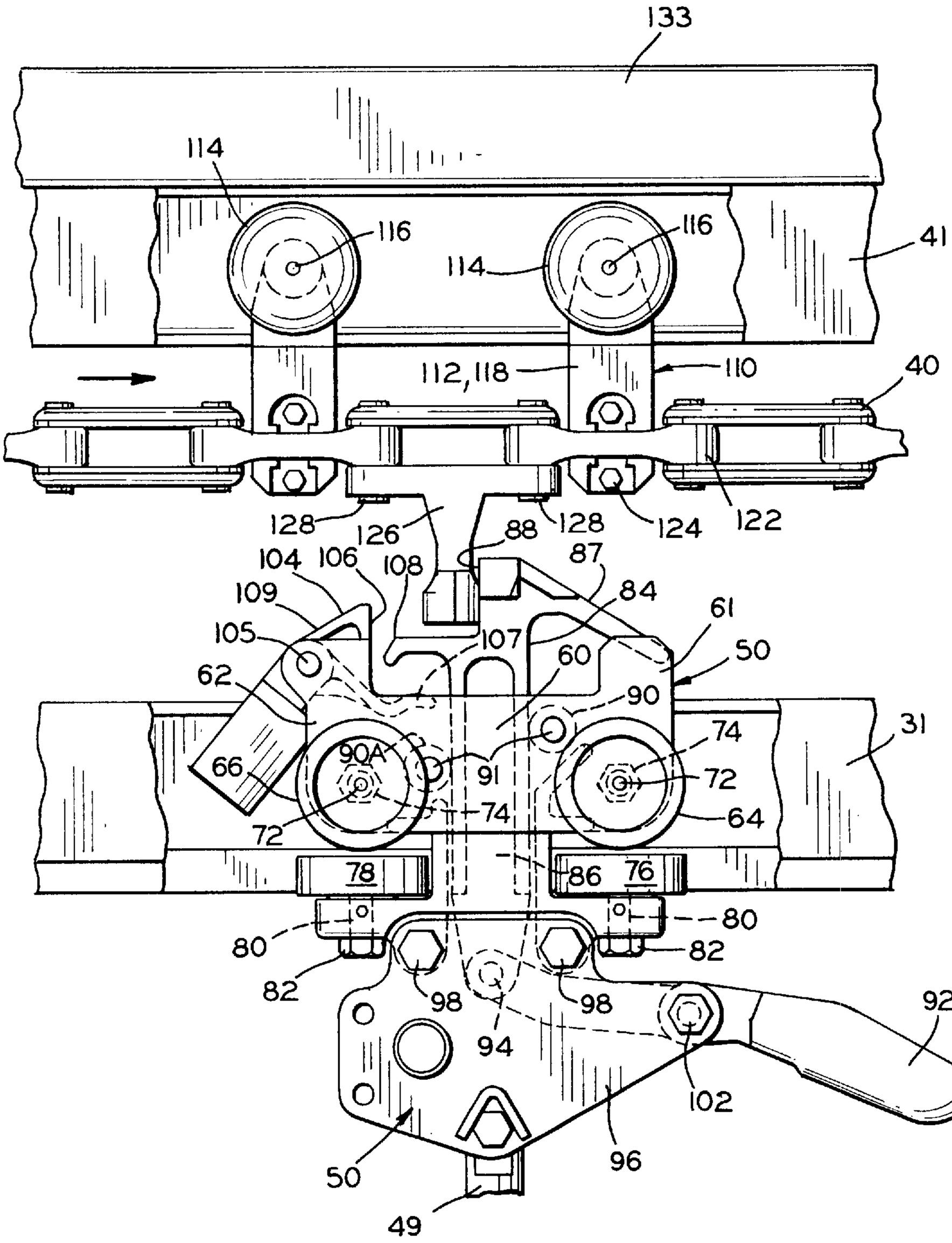
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FIG. 3

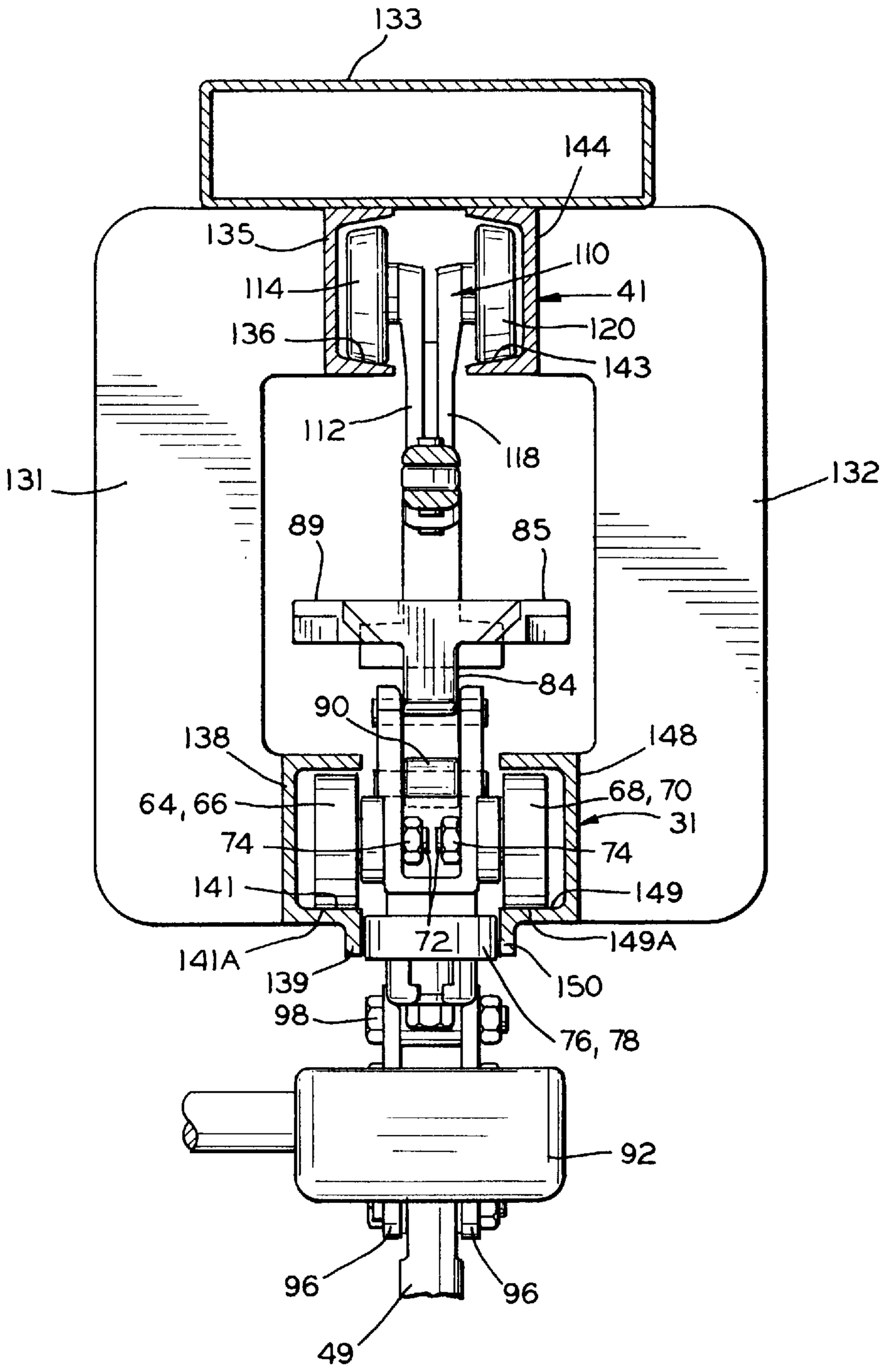
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FIG. 4

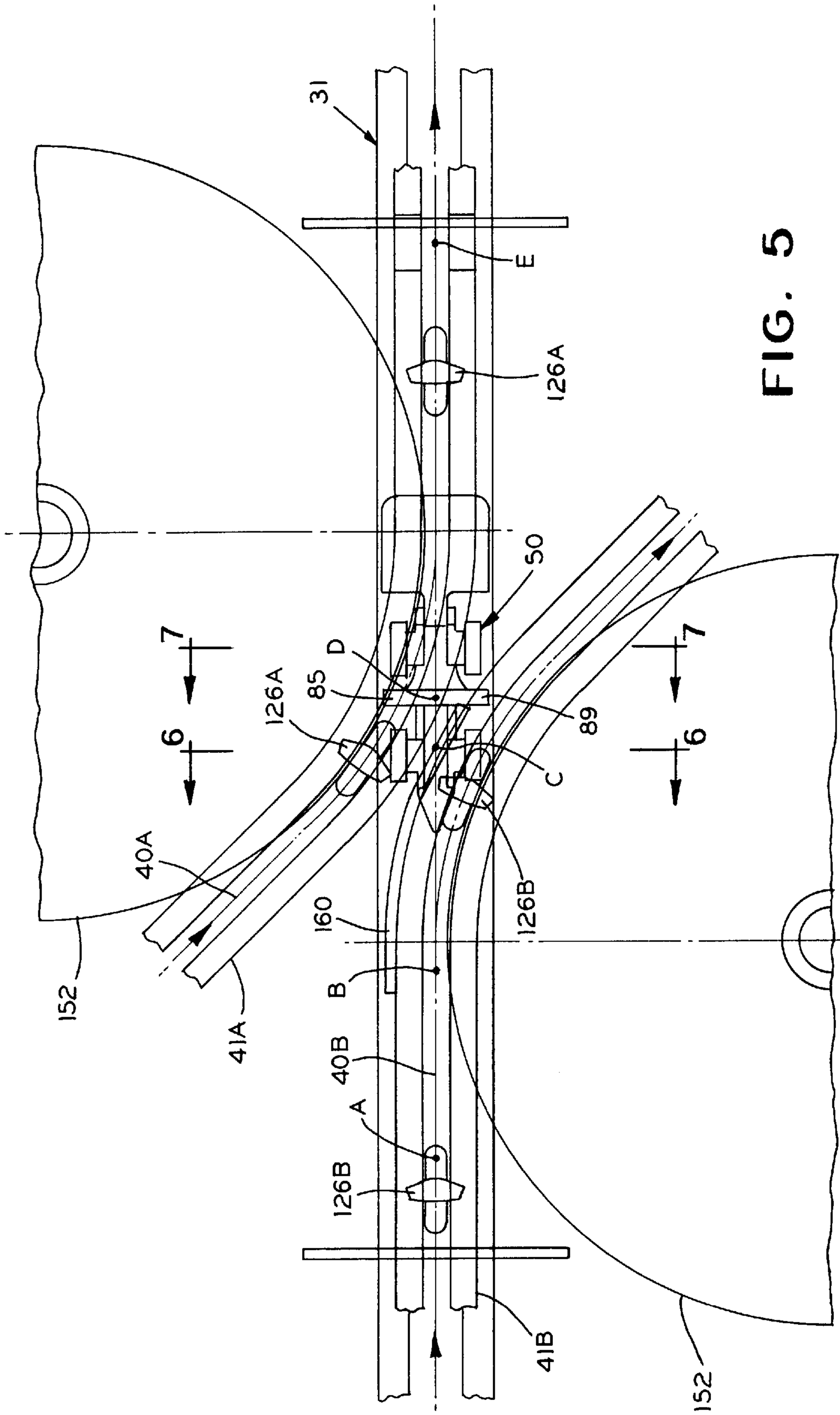
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FIG. 5

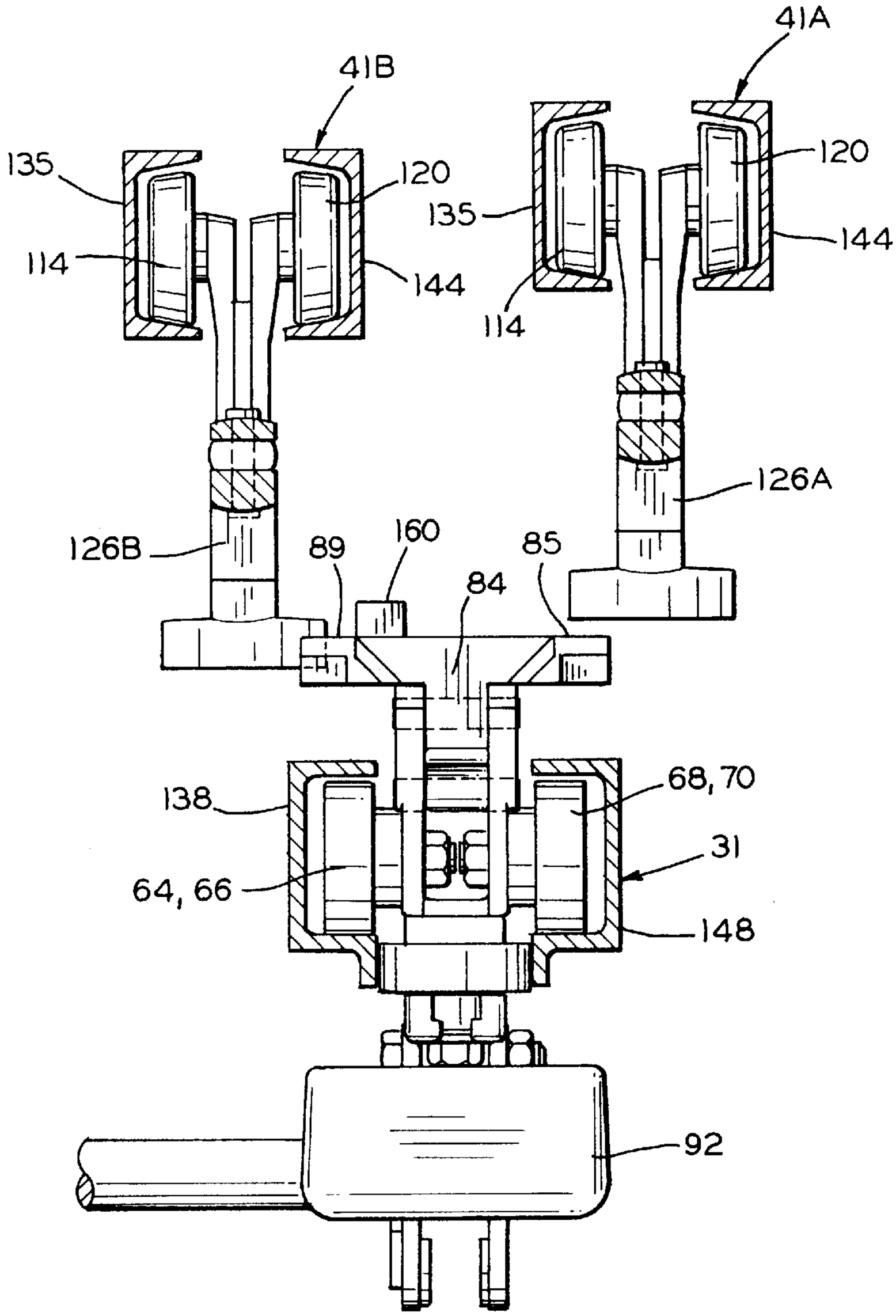
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FIG. 6

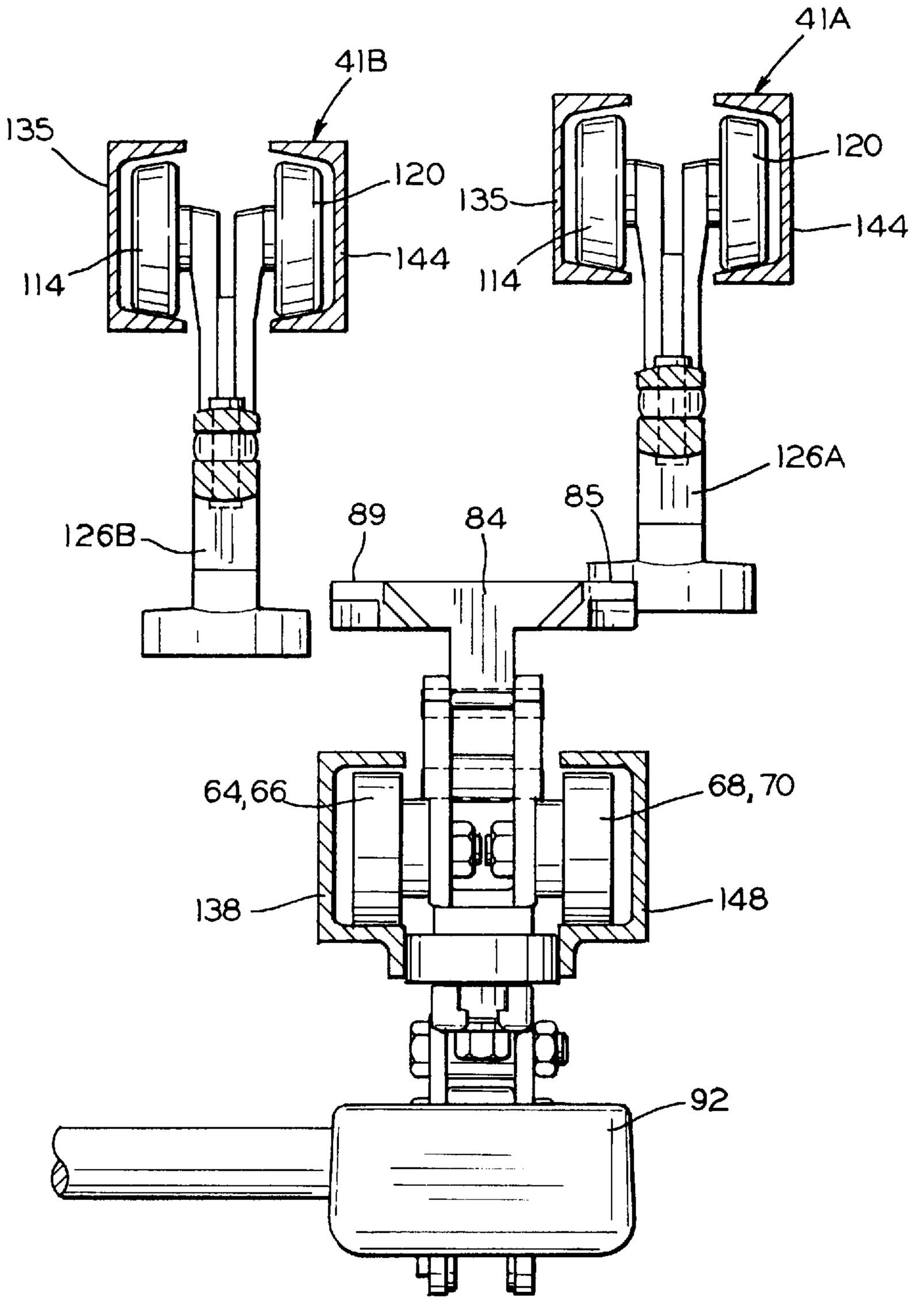

FIG. 7

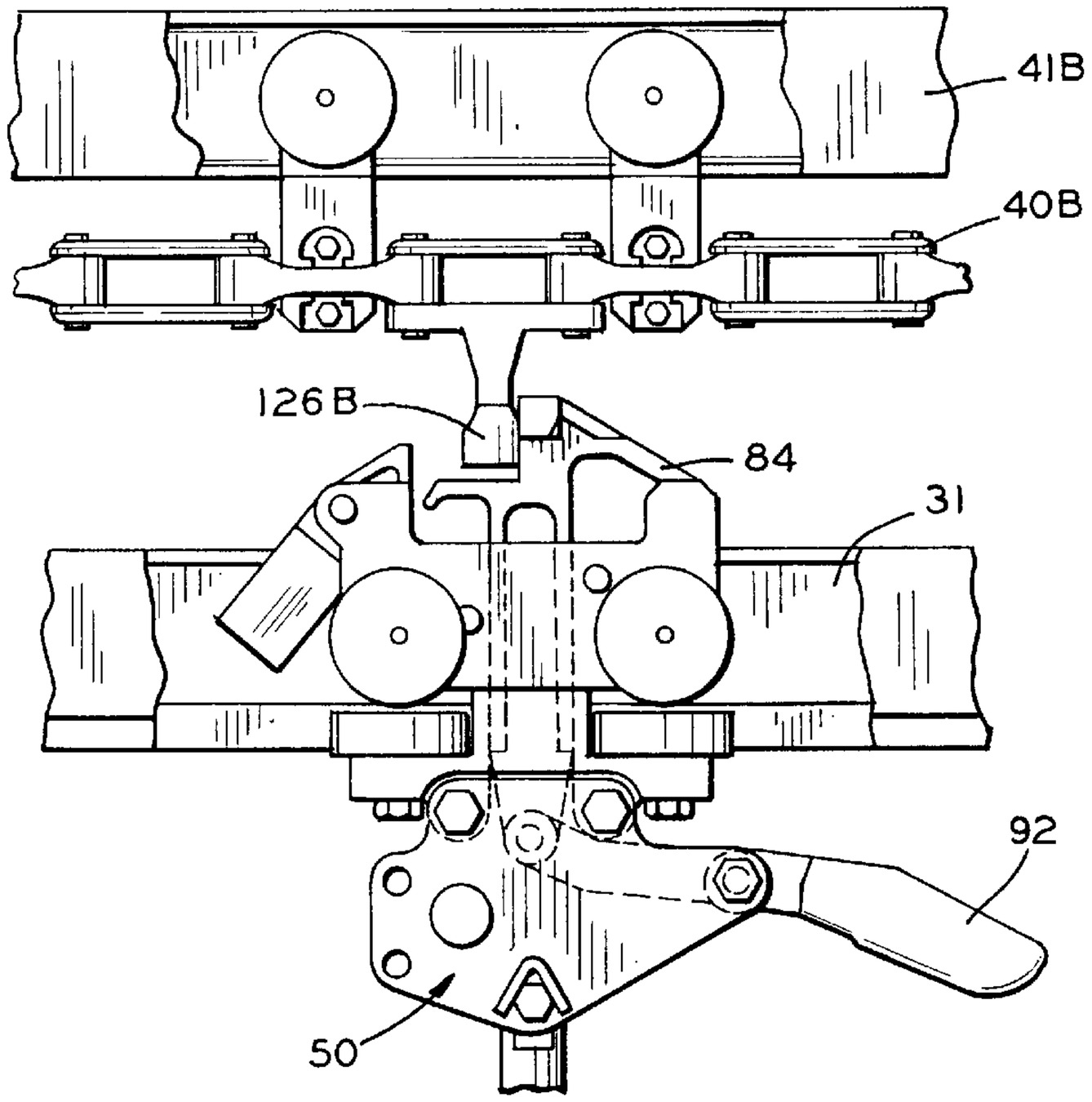

FIG. 8

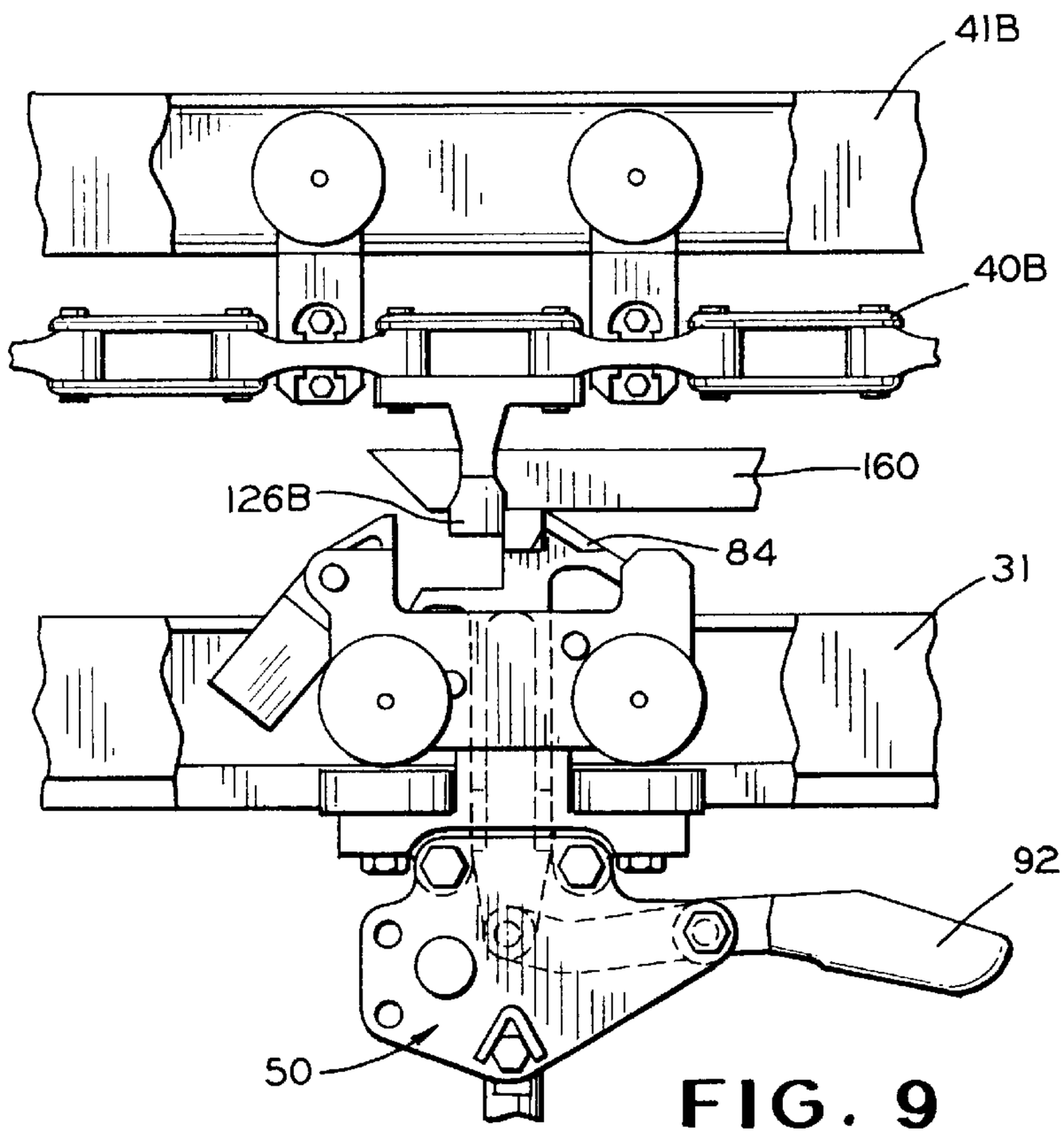

FIG. 9

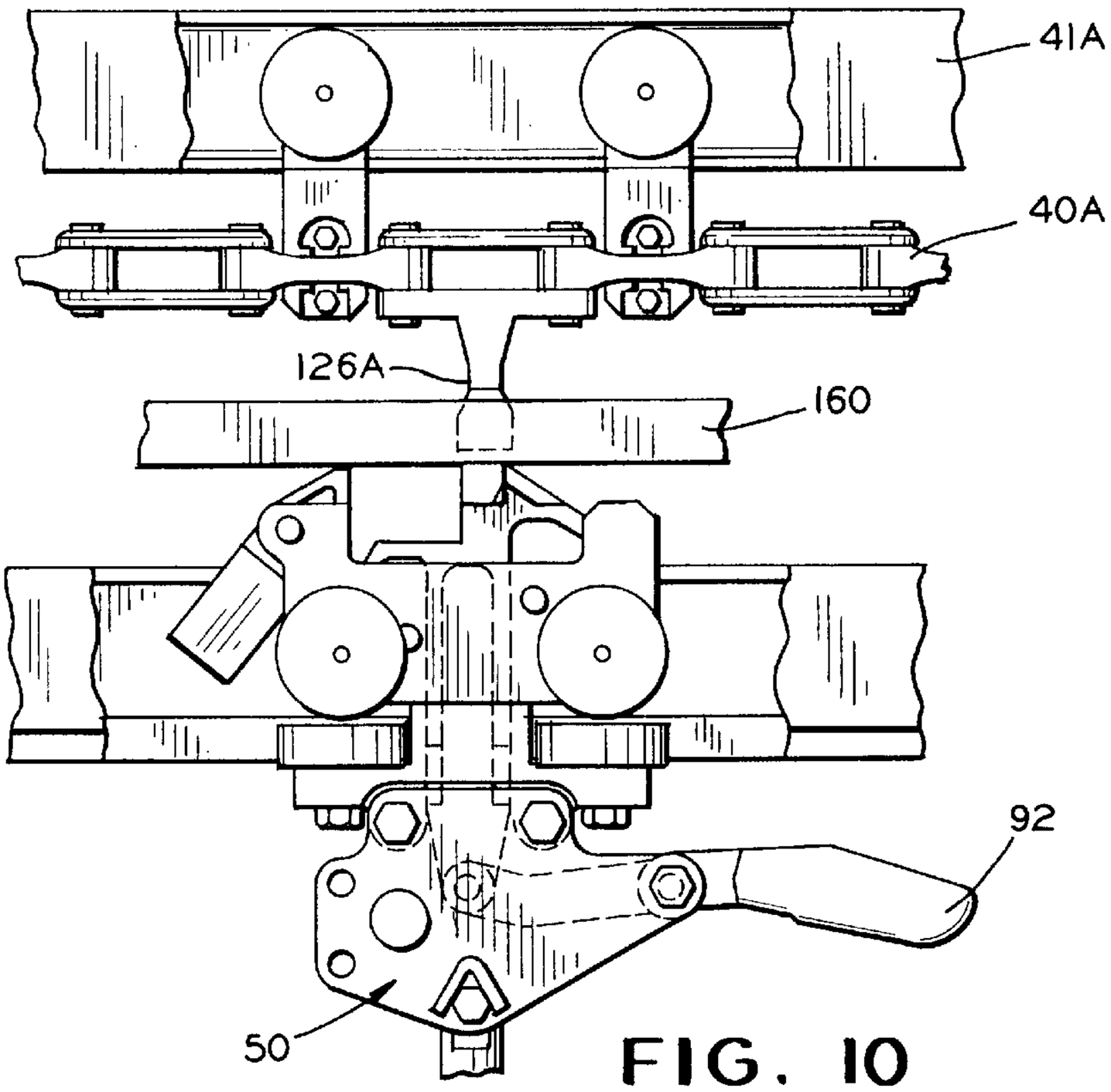

FIG. 10

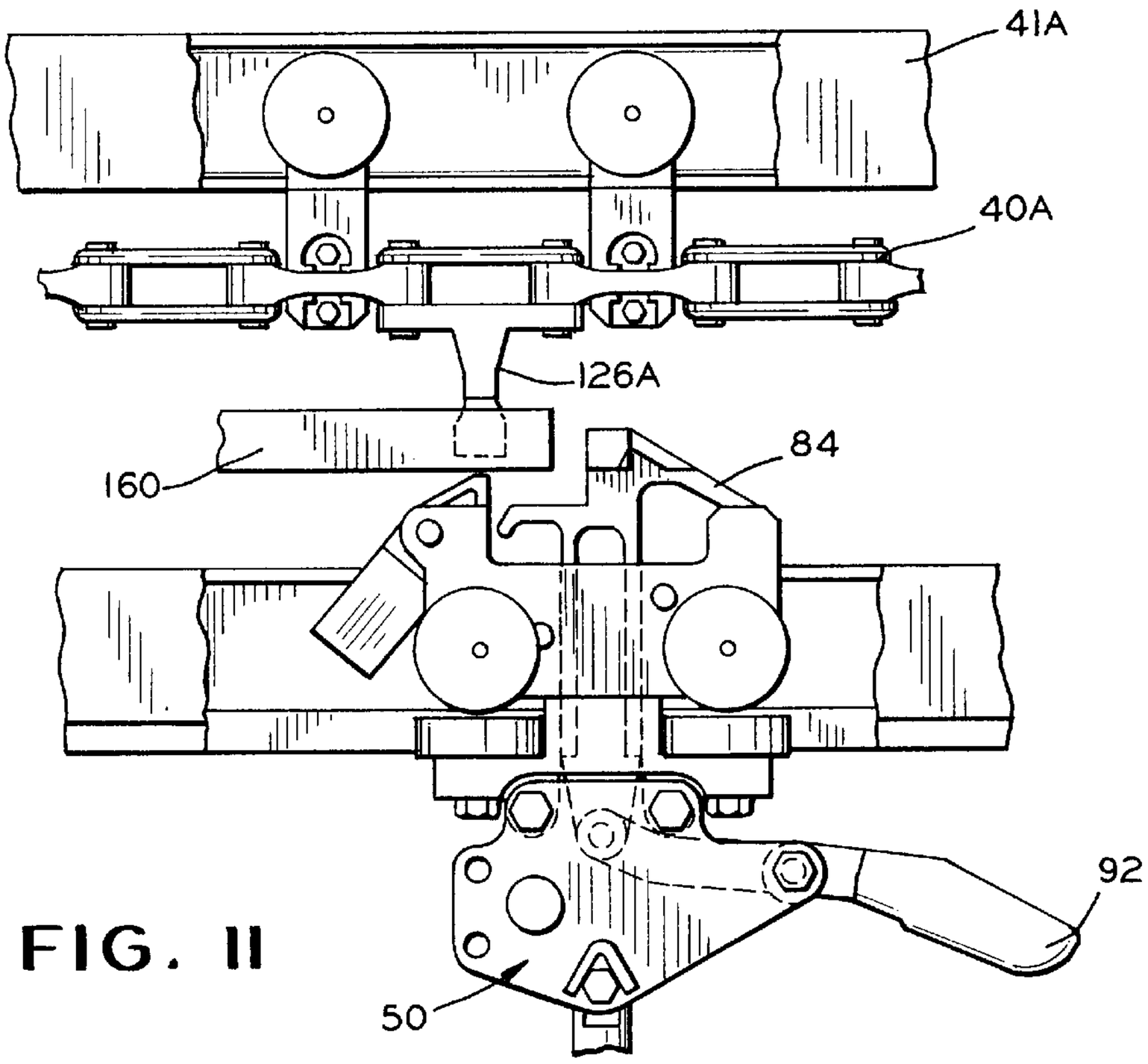

FIG. 11

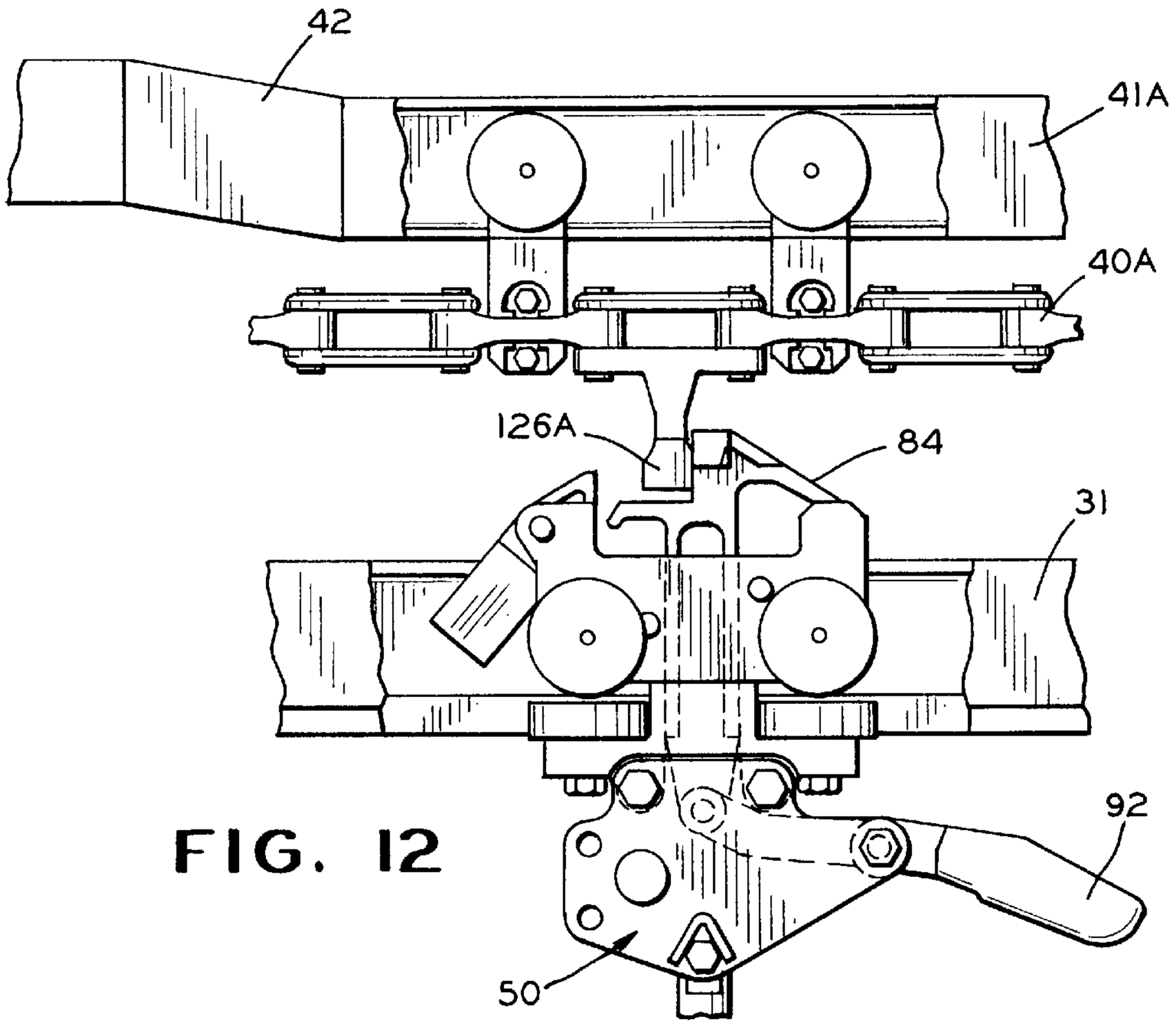

FIG. 12

FIG. 13

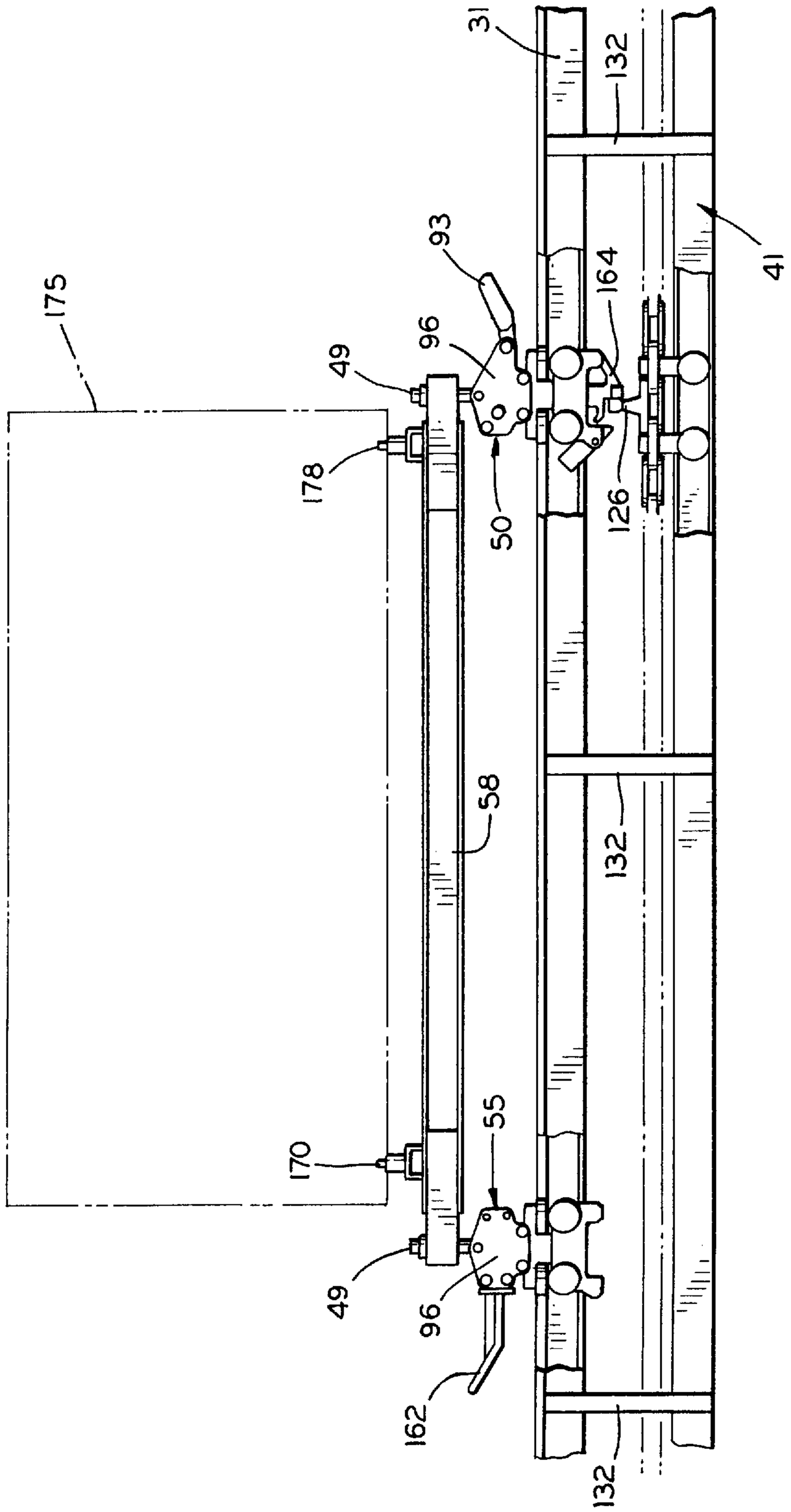

FIG. 14

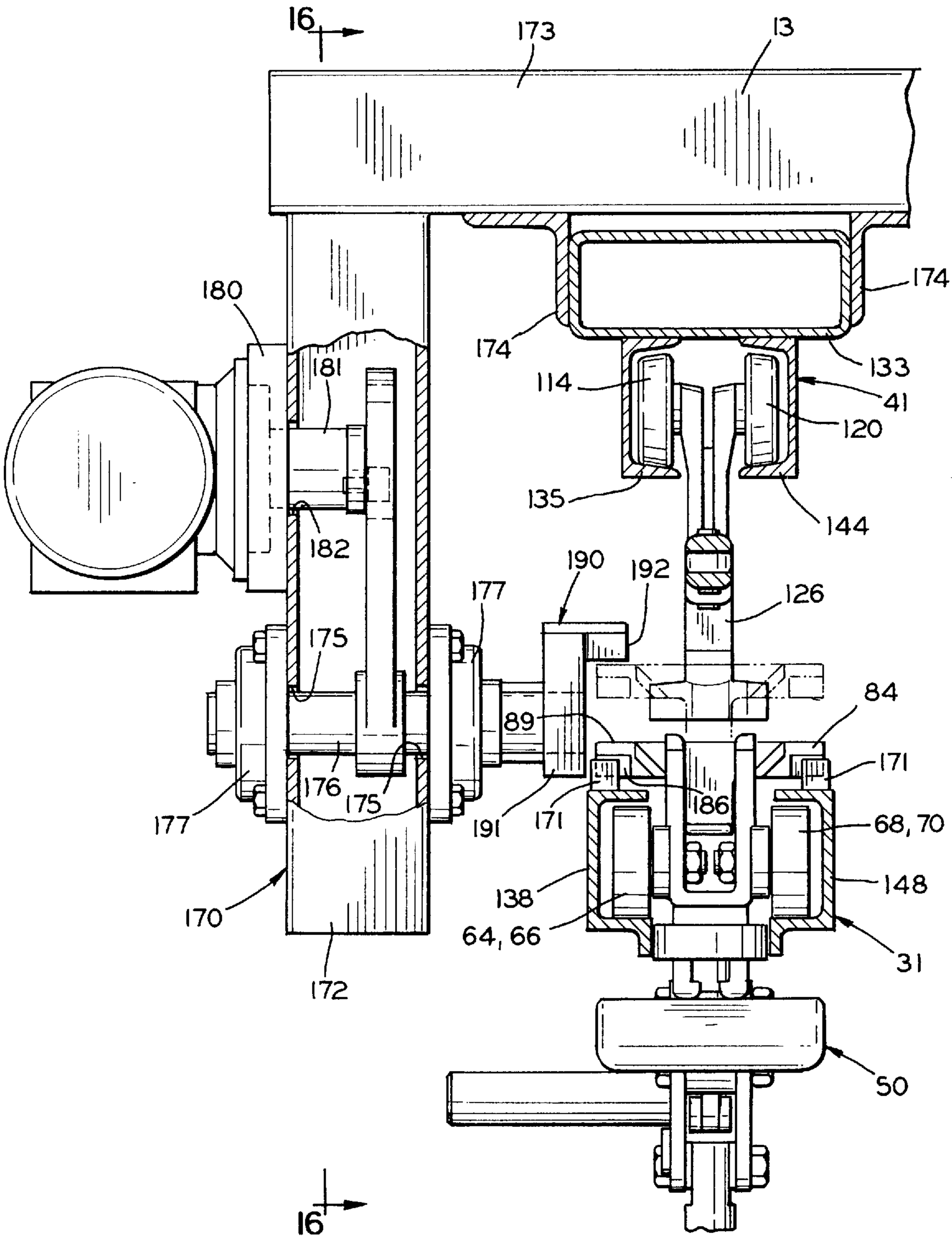
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FIG. 15

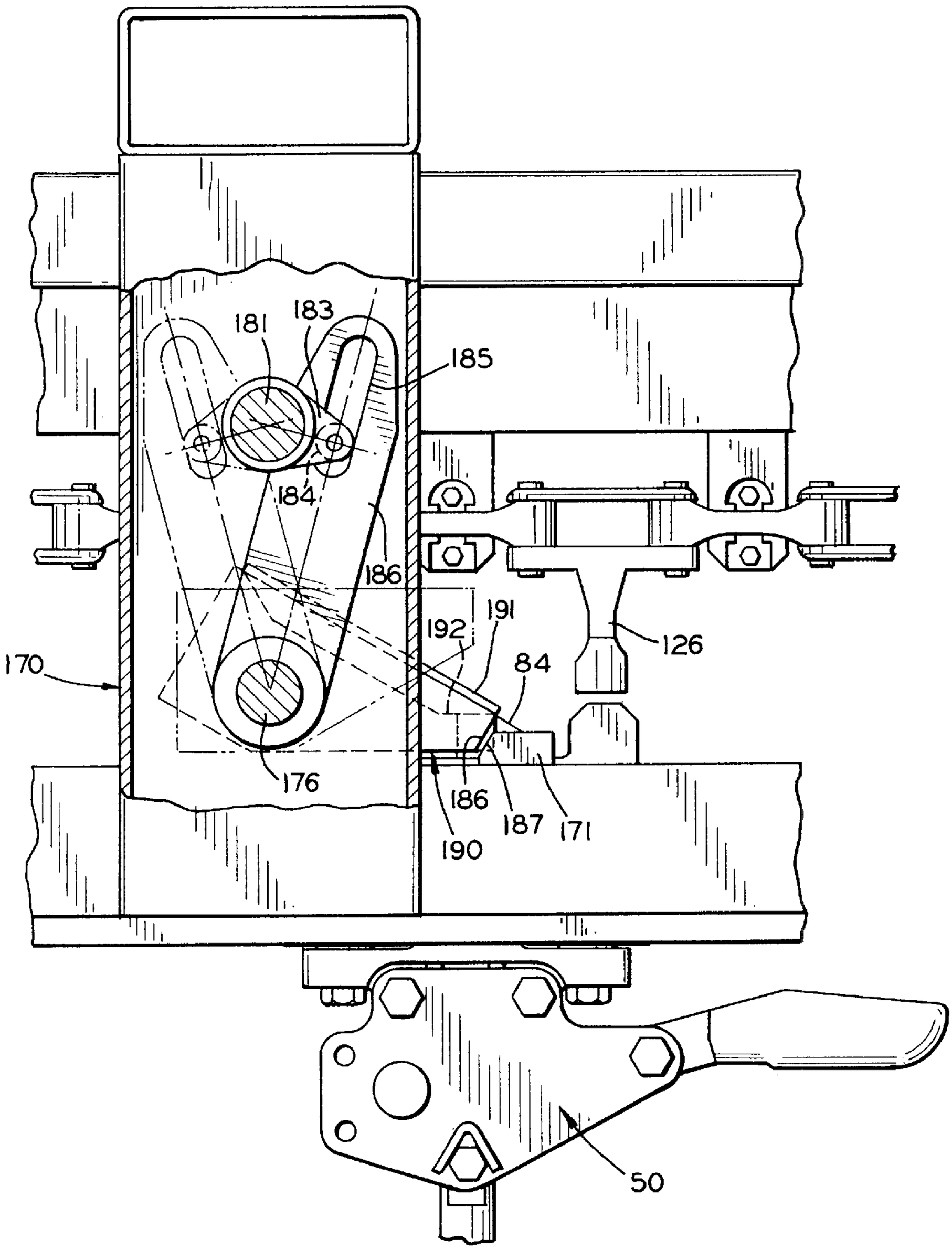

FIG. 16

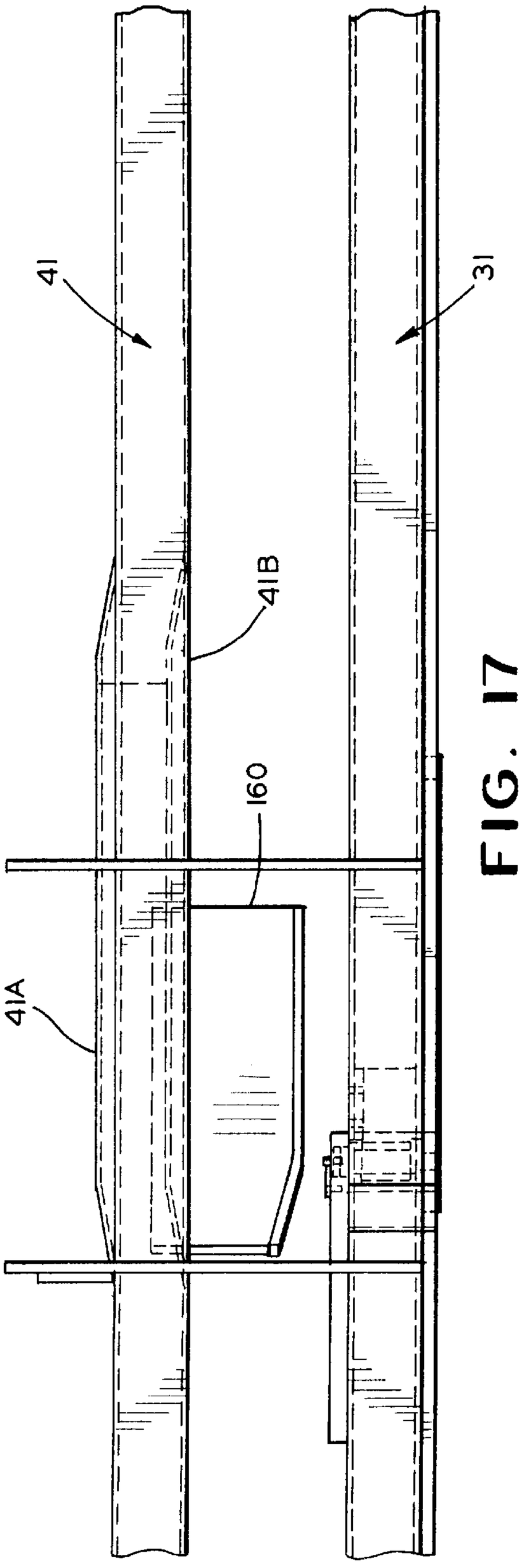

FIG. 17

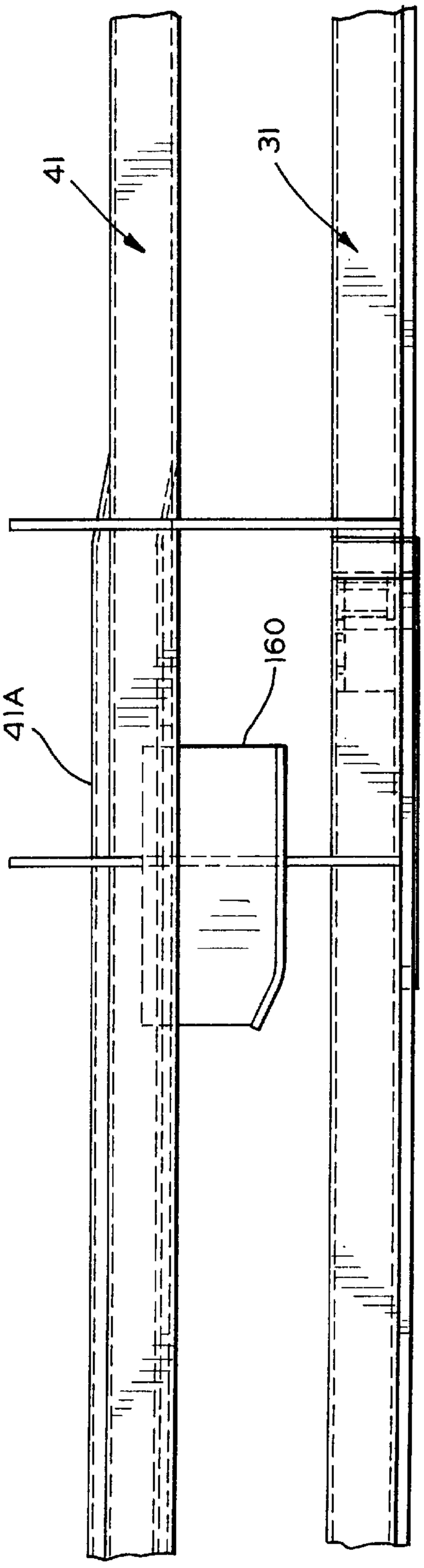

FIG. 18

POWER AND FREE CONVEYOR SYSTEM UTILIZING POWER TRACK AND DOG ELEVATION TO PREVENT JAMMING CONDITIONS AT TRANSFERS AND SWITCHES

RELATED APPLICATION

The present application is a continuation-in-part of U.S. patent application Ser. No. 08/418,214, filed Apr. 6, 1995, now U.S. Pat. No. 5,606,915 in the name of Hugh Harris.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a power and free conveying system. More particularly, the present application refers to power and free conveying systems of the type having a wide retractable power dog on the leading free trolley which permits transfer of the propulsion of the leading trolley from a wipe out power chain to a wipe in power chain. Most particularly, the present invention relates to a conveyor system which utilizes the position of a retractable wide dog in relation to the position of a power trolley to prevent jamming at transfer and switch points.

2. Description of the Prior Art

Power and free conveyor systems, both overhead and inverted, have been known in automobile plants and other plants for many years. They are particularly adapted to automotive assembly plants for movement of various components of automobile vehicles. Typically, power and free conveyors are used to convey engines, automobile bodies, and various other components to assembly areas in automotive plants.

A representative power and free conveying system includes a power track, a free track vertically spaced from a power track, a power trolley supported on the power track for movement therealong, and a free trolley to support a load on the free trolley track. The free trolley is engageable and disengageable from the power trolley. The power trolley is typically chain driven to move the free trolley along a free track from one assembly station to another.

In more complex power and free conveyor systems, the capability of providing transfer zones to which a carrier is propelled by a forwarding pusher dog or member, and from which the carrier is to be propelled by a receiving pusher dog or member, are provided. The forwarding and receiving pushers may be part of separately driven forwarding and receiving propelling means, so that carrier speed, or relative spacing, or both, may be varied as desired throughout the system.

There have always been problems in this art when the forwarding, or wipe out, pusher dog is to disengage itself from a retractable dog, and the receiving, or wipe in pusher dog, is then to pick up the retractable dog to transfer a free trolley to the work station. Originally both of these operations could not be performed on the same free trolley, and the receiving or wipe in pusher dog could only be provided on a wipe in chain spaced some distance from the wipe out or forwarding pusher. The wipe in pusher dog could only engage the lead trolley after it was pushed some distance into the transfer zone by the forwarding or wipe out pusher acting on the trailing trolley of a carrier.

While these power and free conveyors worked satisfactorily, and were manufactured by many companies such as Southern Systems, Inc. of Memphis, Tenn.; Midwest Conveyor Company of Kansas City, Kans.; the Jervis B. Webb Company of Farmington Hills, Mich.; and ACCO division of American Chain and Cable, Inc. Of Warren, Mich., the long transfer stations were uneconomical, and took up valuable space. Those skilled in the art continued to search for a way to eliminate them.

The answer to these problems in the art was the advent of the wide dog power and free conveyor system, such as that disclosed in U.S. Pat. No. 4,616,570 to Clarence A. Dehne, and assigned to the Jervis B. Webb Company of Farmington Hills, Mich. For the first time, the transfer could take place entirely on the leading free trolley, eliminating the need for the long transfer sections.

However, the ability to do this depended upon careful alignment of anti-jam cam surfaces on the forwarding pusher, the receiving pusher, and the wing portions of the driving dog of the free trolley. If these were not aligned just right, if dirt affected the positions of the cam surfaces, or a tolerance stack up misaligned the surfaces, jamming conditions could still occur. Also, because of the anti-jam cam surfaces, positive pickup of the receiving pusher dog is not assured. Thus, those skilled in the art continued to search for a way to provide a power and free conveyor that did not depend on close alignment of anti-jam cam surfaces.

SUMMARY OF THE INVENTION

In order to provide a solution to the above problems long standing in the art, a power and free conveyor system is provided which utilizes a difference in height between the wipe in power trolley and the wipe out power trolley, with or without a "camming down" of the retractable wide dog of the free trolley, to allow the wipe in power chain to wipe in over the retractable dog. This allows the power chain to be in proper position for engagement with the free trolley, all without any possibility of a lateral jamming of the wipe in pusher dog with the retractable dog.

In one embodiment of the present invention, there is provided a power and free conveying system of the type having a wipe in power chain, a wipe out power chain, and a free track spaced vertically from both said wipe in power chain and said wipe out power chain. A free trolley having a retractable dog is supported on said free track for movement therealong. At a transfer or switch, the elevation of said wipe in power chain is made sufficiently different from the elevation of the wipe out power chain to allow said wipe in power chain to wipe in over said free trolley without engaging said retractable dog of said free trolley. All that is necessary for this embodiment of the invention to work is for the wipe in power chain and wipe out power chain to travel a sufficient distance to effect the transfer. When the wipe in power chain drops back to the elevation of the wipe out power chain, the wipe in pusher dog will engage the retractable dog of said free trolley to power the same.

In another embodiment of the present invention, there is provided a power and free conveyor of the type having at least one chain to chain transfer. The conveyor includes a wipe in power chain having a wipe in pusher dog, a wipe out power chain having a wipe out pusher dog, and a free trolley having a multi-position, retractable, wide dog supported on a free track spaced vertically from the wipe in power chain and the wipe out power chain for movement along said free track when said free trolley is engaged by said wipe in power chain or said wipe out power chain. A cam down bar is provided at said transfer portion of said power and free conveyor and acts on the wide dog at said transfer portion to move said wide dog from a first extended position to a second or "cammed down" position. At the same time, the

elevation of said wipe in power chain at said transfer or switch portion of said power and free conveyor is made greater than the elevation of said wipe out power chain. This allows the wipe in pusher dog to wipe in over said retractable wide dog while said wide dog is in its retracted, or cammed down, position without engaging the retractable dog. The retractable dog will return to its first extended position after passing out from under said cam down bar and be partially engaged by said wipe in pusher dog. The elevation of said wipe in power chain thereafter drops to the elevation of said wipe out power chain and the power dog is fully engaged by the wipe in power dog. The camming down of the retractable dog eliminates the need for the wipe in power chain and the wipe out power chain to travel together an extended distance to make the transfer. It also eliminates a problem which may occur in the previously described embodiment, that of jamming if one of the chains is stopped.

In a still further embodiment of the present invention, an inverted power and free conveyor is provided having the foregoing advantages.

Therefore, it is an object of the present invention to provide an improved power and free conveyor of the wide dog type utilizing the relative positions of the retractable wide dog and the power chains to provide for transfers on the leading free trolley of a carrier whereby jamming conditions are eliminated.

Yet another object of the present invention is to provide a free trolley having a retractable wide dog with increased dog bite and multi-position capability.

Another object of the present invention is to provide a power and free conveyor free trolley having a multi-position retractable dog having a first or fully extended position, a second partially retracted or cammed down position and a third accumulating position.

Further objects and advantages of this invention will be apparent from the following description and dependent claims, reference being made to the accompanying drawings forming a part of the specification, wherein like reference characters designate corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagrammatic plan view of a representative conveyor system embodying the construction of the present invention;

FIG. **2** is an elevational view of a load or engine carrier such as may be used in the construction shown in FIG. **1**, with the power track shown in phantom lines;

FIG. **3** is an enlarged fragmentary side elevational view of the front or free trolley utilized in the construction shown in FIG. **2**;

FIG. **4** is a end elevational view of a the power and free trolley shown in FIG. **3**;

FIG. **5** is an enlarged plan view of the transfer mechanism of the power and free conveying system shown in the view circle **5** of FIG. **1**;

FIG. **6** is a sectional view taken, in the direction of the arrows, along the section line **6—6** of FIG. **5**, when the free trolley is under the cam bar;

FIG. **7** is a sectional view, taken in the direction of the arrows, along the section line **7—7** of FIG. **5**;

FIG. **8** is a fragmentary elevational view of the free trolley shown in FIG. **3** when it is at the position A indicated in FIG. **5**;

FIG. **9** is a fragmentary elevational view of the free trolley shown in FIG. **3** when it is at the position B indicated in FIG. **5**;

FIG. **10** is a fragmentary elevational view of the free trolley shown in FIG. **3** when it is at the position C indicated in FIG. **5**;

FIG. **11** is a fragmentary elevational view of the free trolley shown in FIG. **3** when it is at the position D indicated in FIG. **5**;

FIG. **12** is a fragmentary elevational view of the free trolley shown in FIG. **3** when it is at the position E indicated in FIG. **5**;

FIG. **13** is a fragmentary elevational view of the construction shown in FIG. **3** in its accumulating or fully retracted position;

FIG. **14** is an elevational view of an inverted power and free conveyor embodying the construction of the present invention;

FIG. **15** is an end view of the stop means used in the present invention showing the stop member in the open, or released position;

FIG. **16** is an elevational view of the stop means used in the construction of the present invention, showing the stop member in the closed, or blocked, position.

FIG. **17** is a fragmentary elevational view of the switch shown in the view circle **17** of FIG. **1**; and

FIG. **18** is a fragmentary elevational view of the switch shown in the view circle **18** of FIG. **1**.

It is to be understood that the present invention is not limited in its application to the details of construction and arrangements of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments, and of being practiced or carried out in various ways within the scope of the claims. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description, and not of limitation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The description of the preferred embodiment of the present invention shows an overhead power and free conveyor utilizing engine carriers of the type that might be found in an automotive plant. From the description, it will be easily understood that the present invention can be used in other than automotive plants and, indeed, anywhere where its ability to carry loads overhead can be utilized. It can also be understood that the present invention can be constructed in an inverted position for use in an above ground or in ground conveying systems, and be well within the scope of the present invention.

Referring to FIG. **1**, there is shown an overhead power and free conveying system, generally designated by the numeral **30**, embodying the construction of the present invention. The power and free conveyor system may have a first or main free trolley track indicated by the numeral **31**, and shown in a solid heavy line.

Depending on the number and type of work stations or storage lines present in the system, the power and free conveyor system **30** may also have one or more second or branch trolley tracks shown as a heavy line, and indicated by the numeral **32**. Switches **33**, carried in switch frames **34**, provide entry and exit into the branch free trolley track **32**. Branch free trolley tracks **32** are utilized to carry engines or other work pieces past work stations where the speed through the work station may be the same as the speed of travel in the overhead power and free conveyor system **30**. If a work station is present wherein the speed of travel must be different than the speed of travel through the remaining

portions of the power and free conveyor system **30**, a separate power chain to be described below, may be used.

In FIG. **1** the power chains are shown in dotted lines and indicated by the numeral **40**. As will be described further hereinbelow, the power chains are of two types, a wipe in power chain indicated by the numeral **40**A (FIG. **5**), and a wipe out power chain indicated by the numeral **40**B (FIG. **5**).

The power chains **40** are carried on a power trolley track **41** above the free trolley track **31** shown in FIG. **3** and spaced vertically therefrom. Mounted for travel along the free trolley track **31** may be such as an engine carrier assembly generally designated by the numeral **44** (FIG. **2**) and consisting of an engine carrier **45** mounted by a pair of rocker pivots **46** to a beam **47**. At each end of the beam **47** is provided an adapter **48**. The adapter **48** is mounted to a king pin **49** which is attached either to the leading free trolley generally designated by the numeral **50** or the trailing free trolley generally, designated by the numeral **55**.

Referring now to FIG. **3**, the construction of the leading free trolley **50** may be seen in greater detail. The free trolley **50** has a trolley body **60** which has a pair of transversely spaced first upstanding projections **61** and a pair of transversely spaced second upstanding projections **62** spaced longitudinally from the first upstanding projections **61** at the upper end of the trolley body **60**.

As shown in FIG. **4**, the forward free trolley **50** includes forward and rear first free trolley wheels, **64** and **66** respectively, for engaging the first free track member **138**, and forward and rear second free trolley wheels **68** and **70** respectively for engaging the second free track member **148**. In the illustrated embodiment of the invention, each of the trolley wheels **64,66** and **68,70** has a flat face **141**A,**149**A to engage the track surfaces **141** and **149** respectively of the first free track member **138** and second free track member **148** and eliminate track spreading forces. However it can be understood in the art that, if desired, the more commonly available steel channel may be used which has inner tapered surfaces and in this instance the flat faces may be tapered to match the inner surfaces of the first free track member and second free track member.

Each of the free trolley wheels **64,66,68**, and **70** are of the ball bearing type having a shaft **72** extending transversely through the trolley body **50**, and secured by nut **74**. It should also be appreciated that the free trolley wheels **64,66,68** and **70** are easily removable from the free trolley **50**. It can easily be understood by those skilled in the art that the rollers **64,66,68** and **70** do not need to be of a ball bearing type, but may be of any type desired which has the appropriate load carrying capacity.

The free trolley **50** may include forward and rear side guide rollers **76** and **78** respectively disposed between the down standing flanges **139,150** for engaging the down standing flanges of the first and second free track members **138,150** respectively. Each of the side guide rollers **76,78** may also be of the ball bearing type having a shaft **80** (FIG. **5**) extending downwardly through the trolley body **60** and secured thereto by the nuts **82**. It should be appreciated that the side guide roller **76,78** are removable for ease of maintenance.

The leading free trolley **50** also includes a retractable dog **84** having a leg portion **86** extending downward through the trolley body **60**. The retractable wide dog **84** has a cam face **87** which may be engaged by the pusher dog **126** if the free trolley overruns the pusher dog. The driving face **88** is engaged by the chain pusher dog **126** to be described. The retractable wide dog **84** also has wing portions **85** and **89** extending transversely a predetermined width to provide an increased area for transverse pusher dog engagement.

The leg portion **86** of the retractable wide dog **84** is disposed between a front force guide roll **90** and a rear force guide roll **90**A, to prevent longitudinal movement thereof. The guide rolls **90,90**A are rotatably secured to the trolley body **60** by pins **91**. It can be understood that any suitable means may be used to rotatably secure the guide rolls **90,90**A to the trolley body **60**. The rolls **90**, **90**A prevent the retractable wide dog **84** from sticking in a retracted position, which could occur if the dog **84** were guided by sliding surfaces.

The leading free trolley **50** further includes an actuating lever or counter weight **92** rotatably secured by a fastening means **94** to a lower portion of the leg portion **86**. The leading free trolley **50** includes a pair of side plates **96** secured to the trolley body **60** by suitable fasteners **98**. The counter weight **92** is rotatably secured between the side plates **96** by suitable means such as the fastener **102**. It should be appreciated that when the counter weight **92** is moved upwardly in a manner to be described, the leg portion **86** moves downwardly to cause the retractable wide dog **84** to be retracted.

The leading free trolley also includes a hold back dog **104** rotatably secured between the second transversely spaced upstanding projections **62** by any suitable fastening means, such as a fastener **105**. The hold back dog **104** has a dog portion **106** which may engage a pusher dog **126** to be described. The hold back dog **104** also has an actuation flange **107** which may be engaged by a corresponding actuator flange **108** of the leg portion **86** of the retractable wide dog **84**. The hold back dog **104** also has a cam surface **109** which acts to rotate the holdback dog **104** downwardly if overtaken by a pusher dog **126**. It can be seen that the retractable wide dog **84**, and the hold back dog **104**, allow the leading free trolley **50** to resist disengagement from the chain pusher dog **126**.

The construction of the trailing free trolley **55** (FIG. **2**) is similar in several respects to the leading free trolley. Many identical parts are used. The trolley body **60** is identical, as are the forward and rear first free trolley wheels **64** and **66** respectively. The forward and rear second free trolley wheels **68** and **70** may also be identical as are the securing means therefore. The forward and rear side guide rollers **76** and **78** are identical as are the attachment means therefore **80**, **82**. The side plates **96**A (similar to side plates **96**) are used, and a king pin **49** is mounted thereto. However, absent from the trailing rear trolley **55** are the counter weight **92** and the retractable wide dog **84**. Also absent is the hold back dog **104**. However, added to the trailing rear trolley, and not found on the leading free trolley **50**, is the cam actuator **162** which is used to accumulate the trolleys, as will be further explained below.

The overhead power and free conveyor system **30** includes a plurality of power trolleys (FIGS. **3–4**), generally indicated by the numeral **110**, for movement along the power track assembly **41**. The power trolley **110** includes a first power trolley support **112** having a first power trolley wheel **114** rotatably secured to an upper portion thereof by suitable means such as axle **116**. The power trolley **110** also includes a second power trolley support **118** spaced transversely from the first power trolley support **112** and having a second power trolley wheel **120** rotatably secured to an upper portion thereof by a suitable means such as axle **116**.

The power trolley **110** also includes a chain **122** for engaging the power trolley supports **112,118**. The power

trolley supports **112,118** extend through the chain **122** and are secured to each other by suitable means such as the fasteners **124** above and below the chain **122**. The power chain **40** also includes a chain pusher dog **126** disposed between a pair of power trolleys **110**, and secured to the chain **122** by suitable means such as fasteners **128**. The chain pusher dog **126** engages the retractable wide dog **84** to move the free trolley **50** along the free track assembly **31**. It should be appreciated that the chain **122** is driven by a power source **117** (FIG. **1**) to move the chain assembly **40** along the power track assembly **41**.

Except at transfer points or switch points, the free trolley track **31** is held in a vertically spaced axially aligned relationship with the power trolley track **41** by a plurality of first side support members **131** disposed along and secured to the upper support member **133**. The first side support member **131** has a generally C-shaped cross-section and is secured to the upper support member **133** by suitable means such as welding. Also utilized a plurality of second side support members **132** spaced transversely from the first side support members **131** and disposed along and secured to the upper support member **133** opposite the first side support member **131**. The second side support members **132** have a generally C-shaped cross-section and are secured to the upper support member **133** by suitable means such as welding.

The first side support member **131** includes an upper power track or rail **135** forming a portion of the power trolley track **41** mounted at a transverse end of an upper portion thereof. The upper power track member or rail **135** has a generally C-shaped cross-section with an interior wheel engaging or track surface **136** on a lower portion thereof for engagement by first power trolley wheel **114**. The first side support member **131** also includes a first or lower free track member **138** forming a portion of the free trolley track **31**. The first free track member **138** may be identical in cross-section to the upper power track member **135**, or as illustrated in the preferred embodiment hereof, may have a down standing flange **139** at the lower portion thereof.

The second side support member **132** includes a second or upper power track member **144** forming a portion of the power trolley track **41** at a transverse end of an upper portion thereof and spaced transversely from the first or upper power track member **135**. The second power track member **144** has a generally C-shaped cross-section and is a mirror image of the first or upper power track **135**. The second power track member **135** has an interior wheel engaging or track surface **143** for engagement by the power trolley wheels **120** previously described.

The second side support member **132** also includes a second or lower free track member **148** at a transverse end of a lower portion thereof and spaced transversely from the first free track member **138**. The second free track member **148** has a generally C-shaped cross-section with a flat interior wheel engaging or track surface **149** on the lower portion thereof for engagement by the free trolley wheels **68,70** previously described. The second free track member **148** also has a down standing flange **150** at a transverse end of the lower portion thereof. The forward side guide roller **76** and the rear side guide roller **78** previously described are constrained by the down standing flanges **139,150** to guide the free trolley **50**. It should be appreciated that the width of the free track is greater than the width of the power track for increased stability, and that the track members **135,144,138** and **148** may be different as shown, or may be all interchangeable.

Referring now to FIGS. **1** and **5**, the improved operation of the present invention may be appreciated. Jamming conditions in power and free conveyor systems, which the present invention eliminates, can occur either at transfer positions indicated at T in FIG. **1** where a free trolley **50** is being transferred from one power chain to another, or where a free trolley **50** is being switched from a first or free trolley track **31** to a second or branch free trolley track **32** by means of switches **33**. At each of the transfer or switch points there is a converging portion of the conveyor system indicated at C, followed by a diverging portion of the conveyor system indicated at D. It has been the problem of jamming at the converging portion C of the conveyor which has constantly been a problem for those in the art.

As hereinbefore mentioned, before the advent of the wide dog conveyor systems, long transfer portions were needed because the transfer could not take place on the same trolley. With the advent of the wide dog on a leading trolley, the pick up and transfer could take place on the same trolley as long as certain anti-jam cam surfaces were carefully aligned. The problem of jamming is completely eliminated with the present invention by use of a multi-position retractable dog in combination with a varying in elevation of the power trolley tracks.

FIG. **5** is an enlarged view of the transfer area indicated in FIG. **1**, and rotated **909**. For ease of understanding, in describing FIGS. **5** through **11**, the free trolley track will be consistently referred by the numeral **31**. The power trolley track, instead of being referred to by the numeral **41**, will now be referred to by the numeral **41**A for the wipe in or receiving power trolley track, and **41**B for the wipe out or forwarding power trolley track.

It is the relationship of the position of tracks **41**A,**41**B to the position of the wide pusher dog **84**, as it may be operated on by the cam means or cam bar **160** to be described hereinafter, which eliminates the jamming possibilities in the present invention.

The predetermined position of the cam down bar **160** with regard to the wipe out power chain **40**B may vary somewhat as long as its function is performed. In the illustrated preferred embodiment, the cam down bar **160** starts just to the left of the tangent line of the traction wheel **152**. It needs to follow the perimeter of the traction wheel **152** far enough to insure that the leading free trolley **50** has passed the interference zone wherein the chain or pusher dog **126** could strike the side of the wing portion **85** of the retractable wide dog **84** if it were not being held down by the cam bar **160**.

The same design considerations concerning the "interference zone" and the cam bar must also be addressed at the switches **33**. Referring to FIG. **17** there is shown an elevational view of a merge or entrance switch. The general arrangements of switches for power and free conveyors are well known in the art and need not be discussed herein in detail. It is important to note that in the vicinity of the cam bar **160** the elevation of the wipe in power trolley track **41**A is higher than the elevation of the wipe out power trolley track **41**B. As before the cam bar **160** extends for a predetermined distance great enough to permit the wipe in power dog **126**A (not shown) to wipe in over the top of the retractable dog **84** (not shown) to avoid any possible interference.

Likewise, referring to FIG. **18** the same considerations apply to the diverge or exit switch shown.

The cam bar **160** extends for a predetermined distance so that the wipe in pusher dog (not shown) on the wipe in trolley track **41**A will wipe in over the retractable dog **84** (not shown) while the retractable dog is being held down by the cam bar **160**. The cam down bar **160** will not release the

retractable dog until the interference zone is past. It should be noted with regard to FIGS. **17** and **18** that the cam down bar is curved in FIG. **17** and straight in FIG. **18**. In all applications where the cam down bar is curved such as at the transfer zone previously described, the relationship between the elevation of the retractable dog **84** and the hold back dog **104** becomes important, as the hold back dog must also wipe completely under the cam down bar **160** when it is curved. In the illustrated preferred embodiment of the present invention the elevation of the hold back dog is 1⅛" lower than the top of the retractable dog so that when the retractable dog is pushed down 1" by the cam down bar the top of the hold back dog is ⅛" below the top of the retractable dog so that it may wipe under the cam down bar **160**. Since the cam bar can be straight or curved depending on the application, this design consideration must be taken into account whenever a curved cam down bar **160** is used.

Referring to FIG. **6** the relative positions of the wipe in power trolley track **41**A, the wipe out power trolley track **41**B, and the free trolley track **31** are shown just before the end of the cam down bar **160**. It can be seen at this point that the wipe in chain pusher dog, which will now be identified hereinafter by the numeral **126**A for clarity, has already come in over the top of the wing portion **85** of the retractable wide dog **84**. At this point, of course, the interference zone has been passed, and once the cam bar **160** ends, the wipe in pusher dog **126**A will either be behind or on top of the wide dog **84**, and no jamming can occur.

Referring now to FIG. **7**, the free trolley **31** is shown in a position immediately past the end of the cam bar **160** where the retractable dog **84** has returned to its non "cammed down position", and by virtue of being 1" higher, now has a ⅝" bite on the wipe in chain pusher dog **126**A, which is the minimum industry standard. This has occurred while the wipe out chain dog **126**B has moved laterally sideways outside the position where any interference is possible between it and the wide cam dog **84**.

A complete understanding of the invention is now possible by referring to FIG. **5** in combination with FIGS. **8–12** which illustrate the free trolley **31** at the positions indicated by the letters A–E in FIG. **5**. FIGS. **6** and **7** may also be referred to as needed.

Referring now to FIG. **8** (indicated at the position A of FIG. **5**) the wipe out power trolley track **41**B is vertically spaced a distance from the free trolley track **31** which allows the wipe out chain pusher dog **126**B to have a full 1⅝" bite on the adjustable wide dog **84**, which is much greater than the industry standard. This is made possible by the increased stroke of the wide dog to be described hereinafter.

FIG. **9** (indicated at position B in FIG. **5**) shows the leading free trolley **50** and the free trolley track **31** at a position wherein the adjustable wide dog **84** has just been depressed 1" by the cam down bar **160**, allowing only a ⅝" bite between the wipe out chain pusher dog **126**B and the retractable wide dog **84**. Although these dimensions may vary slightly, it is felt in the industry that a ⅝" bite is the minimum practical bite to prevent any operational problems between the pusher dog **126**B and the retractable dog **84**.

Referring now to FIG. **10** (indicated at position C in FIG. **5**), for ease of understanding the wipe out power trolley track **41**B has been eliminated, but not the cam down bar **160**. It can be seen at position C that the wipe in power trolley track **41**A, and thus the wipe in pusher dog **126**A, has wiped in over the top of the retractable wide dog **84** at an elevation 1" higher than the corresponding wipe out pusher dog **126**B. Since the wipe in chain dog **126**A comes in over the top of the adjustable wide dog **84** while it is being held down by the cam down bar **160**, any possibility of a lateral interference is completely eliminated as long as the cam down bar **160** extends sufficiently to hold the wide dog **84** down past the interference zone.

Referring now to FIG. **11** (indicated at position D in FIG. **5**) it can see that the free trolley **50** has been advanced by the wipe out pusher dog **126**B (FIG. **5**) to a position just past the end of the cam down bar **160**, and the retractable wide dog, previously being held 1" below the position of its maximum extension, has raised up to its fully extended position ready to take a 1⅝" bite on the wipe in pusher dog **126**A. When the wipe in pusher dog **126**A returns to an elevation equal to that **6**f the wipe out power dog (not shown for clarity); a full 1⅝" bite is achieved.

Referring now to FIG. **12** (indicated at position E in FIG. **5**) it can be seen that the wipe in power trolley track **41**A has returned to its normal elevation through an decline section **42**, and that the wipe in pusher dog **126**A is again positioned to have a full 1⅝" bite on the retractable wide dog **84**. It should be understood that this method of operation is possible because of the novel use of a much longer stroke for the retractable wide dog **84** than was heretofore thought possible in the industry. Before, to accomplish the ⅝" bite thought necessary for proper operation of a power and free conveyor system, it was necessary to use the approximately 1⅜" stroke previously available in the industry. It was thought to achieve any longer stroke of the retractable wide dog **84** would necessitate the use of an extremely large, and therefore unusable, counter weight **92**. However, it has been found that the size of the counter weight did not have to be enlarged greatly to get the increased stroke which contributes to the novel method of operation of the present invention.

FIG. **13** is a view of a leading free trolley **50** in its accumulating position. The counter weight **92** of the free trolley **50** has run up against an accumulating cam surface **162** (FIG. **2**) and been lifted a sufficient distance to retract the retractable wide dog **84** to its fully retracted position. In this process the actuator flange **108** of the retractable dog **84** has come in contact with the actuation flange **107** of the hold back dog **104** and caused the hold back dog **104** to retract to a position wherein the cam surface **109** can no longer be contacted by the chain pusher dog **126**, thus eliminating the noise generated by chain pusher dogs **126** constantly striking the holdback dog **104**.

Since the pusher dog **126** can not contact either the hold back dog **104** or the retractable wide dog **84** the free trolley **50** and, thus, whatever is attached to it remains stationary until such time as the accumulating cam surface **162** attached to the trailing free trolley **50** moves forward, lowering the counter weight **92**, and extending the retractable dog **84** to a position of "bite" with the pusher dog **126** at which time the free trolley **50** will resume movement.

Referring now to FIG. **14** there is shown an example of how the present invention may be used in an inverted power and free conveyor system for transporting automobile bodies or other heavy objects. In this embodiment of the invention the free trolley track **31** is supported in an inverted position over the power trolley track **41** by the side support members **131**, **132**. The free trolley **50** is identical in most respects to the free trolley just described in the overhead power and free conveyor system. For stability the king pins **49** by which the load carrier **58** is affixed to the leading free trolley **50** and the trailing free trolley **55** are affixed to the side plates **96**, **96**A.

The elevations of the power trolley track **41** will vary at transfer and switch points just as previously discussed to

avoid jamming conditions at such points. Also, the relative weights of the retractable wide dog **84** and the counter weight **92** previously used will be reversed. The retractable wide dog, while retaining all of the same functions of the retractable wide dog **84**, will now be designated by the numeral **164**, and will be made as heavy as possible, either by a change in shape, or a change in material, or both, to act as a counter weight and maintain itself in the fully extended position to take the 1⅝" bite on the chain pusher dog **126** as previously described.

It can be understood that when this is done with the retractable wide dog **164**, it will be desirable that the actuating lever **93** be as light weight as possible so as to not to tend to retract the counter weight **164**. However, the actuating lever **93** must still be strong enough to lift the counter weighted retractable wide dog **164** when it encounters the cam actuator **162** on a trailing free trolley **55**. Pins **170** may be provided on the load carrier **58** to attach objects such as the load **175** to the carrier.

Referring to FIGS. **15** and **16**, an improved stop means for stopping a free trolley at a work station is provided as part of the present invention. The stop means, generally indicated by the numeral **170**, acts to stop a leading free trolley **50** at a desired position in alignment with a work station by rotating stop member **190** to its closed position, thereby lowering the retractable wide dog **84** to a position of interference with stops **171**. The stops **171** are mounted in a transversely spaced and aligned relationship in a predetermined desired position to the first free track member **138** and the second free track member **148** forming a portion of the free trolley track **31**. Rotating the stop member **190** to its open position will release the free trolley **50**.

The stop means **170** includes a housing **172** mounted to a cross beam **173** secured to the upper support member **133** by suitable angles **134**. The housing **172**, cross beam **173**, and angles **174** may be secured to the upper support member **133** by one or a combination of suitable means such as by welding or fasteners, etc. A pair of openings **175** are provided in the housing **172** in an axially positioned relationship to allow a shaft **176** to pass through. The shaft is securely held for rotation in bearings **177** and extends transversely of the housing **172**.

Mounted above the bearing supports **177** on one side of the housing **172** is a geared reduction motor **180**. A reduction motor shaft **181** passes through opening **182** in the housing. Fixedly mounted to the shaft **181** is a crank arm **183** having a cam roller **184** which reciprocates in the slot **185** which is provided in the lever **186** fixedly mounted to the shaft **176**;.

The rotation of the reduction motor **180** will cause the movement of the lever **186** between the positions shown in solid lines and the position shown in phantom lines. Since the lever **186** is fixedly mounted to the shaft **176** the shaft **176** is constrained to rotate between a first position and a second position for the purpose to be explained hereinafter. Because of the right angle formed between the axis of the lever **186** and the crank arm **183**, the arm **183** is "locked" in position, and upward force on the stop member will not cause rotation of the crank arm **183**.

Mounted to the shaft **176** for rotation between first or open position and a closed or second position is a stop member generally designated by the numeral **190** and having a body portion **191** and an extension **192**. The body portion **191** of the stop member **190** is positioned with relation to the free trolley track **31** so that the wing portion **89** of the wide dog **84** will not come in contact with the body portion **191** either in its open or closed position.

The dimensions of the stop member **190** and the extension member **192** are also chosen such that the extension member **192** will not contact the top of the wide dog **84** when it is in its open position, shown in phantom lines in FIG. **16**.

When it is desired to stop the free trolley **50** at a station, means well known in the art such as cams, limit switches or other devices will cause the reduction motor **180** to operate, thus causing the shaft **181** to rotate the crank arm **183** and roller **184** to cause lever **186** to go to its second position, shown in solid lines in FIG. **16**. This second or operative position has also caused the shaft **176** to rotate causing the stop member **190** to rotate to its closed position, shown in solids lines in FIG. **16**.

As shown in FIG. **16** this is caused the extension portion **192** of the stop member **90** to come into contact with the top of the retractable wide dog **84**, more specifically the wing portion **89** of the wide dog **84**, and caused it to be lowered to its fully retracted position wherein the chain pusher dog **126** will pass over the top of it and cause the trolley **50** to come to a positive stop against the stops **171**.

To avoid a possible problem where a wiping action was encountered between the retractable wide dog **84** and the stops **171**, which could prevent the retractable wide dog **84** from again extending once the extension **192** ceased acting on the top of the dog, a beveled surface **186** is provided on both of the wing portions of the retractable wide dog **84** and on the front of the stops **171**. By experimentation it has been found that an angle of 30° has eliminated all sticking problems between the wide dog **84** and the stops **171**.

It will be understood by those skilled in the art that the improved stop member **190** of the present invention can be moved into the path of the free trolley **50** by other means, such as a lateral movement, with or without rotation, and this would be within the scope of the present invention.

Thus, by carefully analyzing problems occurring in present power and free conveyors, and especially problems occurring during transfers and stops, an improved power and free conveyor system is provided which eliminates the possibility of jamming during transfers.

What is claimed is:

1. In a power and free conveying system having a wipe in power chain, a wipe out power chain and a free track spaced vertically from both said wipe in power chain and said wipe out power chain and including a free trolley having a retractable dog supported on said free track for movement therealong, the improvement comprising:

a) the elevation of said wipe in power chain being sufficiently different from the elevation of said wipe out power chain during a switching or transfer operation to allow said wipe in power chain to wipe in over said free trolley without engaging said retractable dog of said free trolley.

2. The power and free conveyor system defined in claim **1**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said hold back dog and said retractable dog of said free trolley.

3. The power and free conveyor system defined in claim **2**, wherein;

a) said retractable dog is a multi-position retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

4. The power and free conveyor system defined in claim **3**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

5. The power and free conveyor system defined in claim **4**, wherein;

a) said retractable wide dog is held in said fully extended position by a counterweight connected thereto.

6. The power and free conveyor system defined in claim **5**, wherein;

a) said counterweight allows said retractable wide dog to have a stroke of at least approximately 1⅝".

7. The power and free conveyor system defined in claim **6**, whrein;

a) said holdback dog includes an actuation flange.

8. The power and free conveyor system defined in claim **1**, wherein said power and free conveyor system is an inverted power and free conveyor system, and said wipe in power trolley track and said wipe out power trolley track are spaced below said free trolley track.

9. The power and free conveyor system defined in claim **8**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

10. The power and free conveyor system defined in claim **9**, wherein;

a) said retractable dog is a multi-position retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

11. The power and free conveyor system defined in claim **10**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

12. The power and free conveyor system defined in claim **11**, wherein;

a) said retractable wide dog has a predetermined weight for maintaining itself in a normally fully extended position.

13. The power and free conveyor system defined in claim **12** wherein;

a) said holdback dog includes an actuation flange.

14. In a power and free conveyor having at least one transfer portion, and including at said transfer portion a wipe in power chain having a wipe in dog, a wipe out power chain having a wipe out dog, and a free trolley having a multi-position retractable wide dog supported on a free track spaced vertically from said wipe in power chain and said wipe out power chain for movement along said free track when said free trolley is engaged by said wipe in power chain and or said wipe out power chain, the improvement comprising:

a) the elevation of said wipe in power chain at said transfer portion of said power and free conveyor being sufficiently different from the elevation of said wipe out power chain to allow said wipe in dog to wipe in over said retractable wide dog without engaging said power dog; said wipe in power chain travelling together with said wipe out power chain for a sufficient distance to effect a transfer.

15. The power and free conveyor system defined in claim **14**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said hold back dog and said retractable dog of said free trolley.

16. The power and free conveyor system defined in claim **15**, wherein;

a) said retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

17. The power and free conveyor system defined in claim **16**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

18. The power and free conveyor system defined in claim **17**, wherein;

a) said retractable wide dog is held in said fully extended position by a counterweight connected thereto.

19. The power and free conveyor system defined in claim **18**, wherein;

a) said counterweight allows said retractable wide dog to have a stroke of at least approximately 1⅝".

20. The power and free conveyor system defined in claim **19**, wherein;

a) said holdback dog includes an actuation flange.

21. The power and free conveyor system defined in claim **14**, wherein said power and free conveyor system is an inverted power and free conveyor system and said wipe in power trolley track and said wipe out power trolley track are spaced vertically below said free trolley track.

22. The power and free conveyor system defined in claim **21**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

23. The power and free conveyor system defined in claim **22**, wherein;

a) said retractable dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

24. The power and free conveyor system defined in claim **23**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

25. The power and free conveyor system defined in claim **24**, wherein;

a) said retractable dog has a predetermined weight for maintaining itself in a normally fully extended position.

26. The power and free conveyor system defined in claim **25**, wherein;

a) said holdback dog includes an actuation flange.

27. In a power and free conveyor having at least one transfer portion, and including at the transfer portion a wipe in power chain having a wipe in power dog, a wipe out power chain having a wipe out power dog, and a free trolley having a multi-position retractable wide power dog supported on a free track spaced vertically from said wipe in

power chain and said wipe out power chain for movement along said free track when said free trolley is engaged by said wipe in power chain and/or said wipe out power chain, the improvement comprising:

a) a cam down bar provided at said transfer portion of said power and free conveyor and acting on said wide dog to move said wide dog from a fully extended position to a cammed down position; and

b) the elevation of said wipe in power chain at said transfer portion of said power and free conveyor being sufficiently different than the elevation of said wipe out power chain to allow said wipe in chain dog to wipe in over said retractable wide dog while said wide dog is in its cammed down position without engaging said dog, said wide dog moving to said fully extended position after passing out from under said cam down bar.

28. The power and free conveyor system defined in claim **27**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said hold back dog and said retractable dog of said free trolley.

29. The power and free conveyor system defined in claim **28**, wherein;

a) said retractable dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

30. The power and free conveyor system defined in claim **29**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

31. The power and free conveyor system defined in claim **30**, wherein;

a) said retractable wide dog is held in said fully extended position by a counterweight connected thereto.

32. The power and free conveyor system defined in claim **31**, wherein;

a) said counterweight allows said retractable wide dog to have a stroke of at least approximately 1⅝".

33. The power and free conveyor system defined in claim **32**, wherein;

a) said holdback dog includes an actuation flange.

34. The power and free conveyor system defined in claim **27**, wherein said power and free conveyor system is an inverted power and free conveyor system and said wipe in power trolley track and said wipe out power trolley track are spaced below said free trolley track.

35. The power and free conveyor system defined in claim **34**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

36. The power and free conveyor system defined in claim **35**, wherein;

a) said retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

37. The power and free conveyor system defined in claim **36**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

38. The power and free conveyor system defined in claim **37**, wherein;

a) said retractable wide dog has a predetermined weight for maintaining itself in a normally fully extended position.

39. The power and free conveyor system defined in claim **38**, wherein;

a) said holdback dog includes an actuation flange.

40. A power and free conveying system including:

a) a wipe in power chain assembly including a wipe in chain dog;

b) a wipe out power chain assembly including a wipe out chain dog;

c) a free track assembly spaced vertically from said wipe out power chain assembly and said wipe in power chain assembly;

d) a free trolley supported on said free track assembly for movement there along; said free trolley including a retractable dog for engagement with said wipe in power chain and/or said wipe out power chain;

e) said retractable dog having a cammed down position where said dog only partially engages said wipe out chain dog while said retractable dog is traveling along said free track for a pre-determined distance while said wipe in power chain wipes into position over said retractable dog.

41. The power and free conveyor system defined in claim **40**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said hold back dog and said retractable dog of said free trolley.

42. The power and free conveyor system defined in claim **41**, wherein;

a) said retractable dog is a multi-position retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

43. The power and free conveyor system defined in claim **42**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

44. The power and free conveyor system defined in claim **43**, wherein;

a) said retractable wide dog is held in said fully extended position by a counterweight connected thereto.

45. The power and free conveyor system defined in claim **44**, wherein;

a) said counterweight allows said retractable wide dog to have a stroke of at least approximately 1⅝".

46. The power and free conveyor system defined in claim **45**, wherein;

a) said holdback dog includes an actuation flange.

47. The power and free conveyor system defined in claim **46**, wherein said power and free conveyor system is an inverted power and free conveyor system and said wipe in power trolley track and said wipe out power trolley track are spaced vertically below said free trolley track.

48. The power and free conveyor system defined in claim **47**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

49. The power and free conveyor system defined in claim **48**, wherein;

a) said retractable dog is a multi-position retractable wide dog having

i) a fully extended position,

ii) a cammed down position, and

iii) a fully retracted position.

50. The power and free conveyor system defined in claim **49**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

51. The power and free conveyor system defined in claim **50**, wherein;

a) said retractable wide dog has a predetermined weight for maintaining itself in a normally fully extended position.

52. The power and free conveyor system defined in claim **51**, wherein;

a) said holdback dog includes an actuation flange.

53. The device defined in claim **40**, and further including:

a) a cam down bar at a transfer or switch portion of said power and free conveyor, said cam down bar acting on said retractable dog to move said retractable dog to its cammed down position; and

b) the elevation of said wipe in chain being greater than the elevation of said wipe out chain proximate said cam down bar to allow said wipe in power chain to wipe in over said retractable dog while in its retracted position without engaging said retractable dog.

54. A power and free conveying system comprising:

a) a track assembly including a wipe in power track, a wipe out power track, and a free track spaced vertically from said power tracks;

b) a wipe in power trolley supported on said wipe in power track for movement there along;

c) a wipe out power trolley supported on said wipe out power track for movement there along;

d) a free trolley supported on said free track for movement there along, said free trolley including;

i) a moveable holdback dog engageable and disengageable with said wipe in power trolley and/or said wipe out power trolley,

ii) a retractable dog having a first or fully extended position engageable with said wipe in power trolley or said wipe out power trolley, said retractable dog being held in said first or fully extended position by the action of a counter weight attached to said free trolley, a second or cammed down position wherein the elevation of said retractable dog is slightly greater than the elevation of said movable hold back dog, said retractable dog being held in said cammed down position when in an interference zone by a fixed, immovable, cam down bar, and a third or fully retracted position disengageable with said power trolley and engageable with said hold back dog to rotate said hold back dog and fully lower said free trolley to disengage said free trolley from said power trolley upon the said counter weight engaging another one of said free trolley, or a stop means;

e) the fixed, immovable cam down bar to hold said retractable dog in said cammed down position when said free trolley is in an interference zone, and

f) a stop means for stoping said free trolley, said stop means being separate and distinct from said immovable cam down bar.

55. The power and free conveyor system defined in claim **54**, wherein;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said moveable hold back dog and said retractable dog of said free trolley.

56. The power and free conveyor system defined in claim **55**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

57. The power and free conveyor system defined in claim **56**, wherein;

a) said counterweight is of sufficient weight to allow said retractable wide dog to have a stroke of approximately 1⅝ inch.

58. The power and free conveyor system defined in claim **54**, wherein said power and free conveyor system is an inverted power and free conveyor system and said wipe in power trolley track and said wipe out power trolley track are spaced below said free trolley track.

59. The power and free conveyor system defined in claim **58**, wherein;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said moveable hold back dog and said retractable dog of said free trolley.

60. The power and free conveyor system defined in claim **59**, wherein;

a) said retractable wide dog is guided within said free trolley by

i) a front force guide roll, and

ii) a rear force guide roll.

61. The power and free conveyor system defined in claim **60**, wherein;

a) said retractable wide dog has a predetermined weight to maintain itself in a fully extended position while permitting a stroke of at least approximately 1⅝".

62. The power and free conveyor system defined in claim **61**, wherein;

a) said holdback dog includes an actuation flange.

63. The power and free conveyor system defined in claim **58**, wherein said free trolley includes a hold back dog in addition to said retractable dog; and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

64. In a power and free conveyor of the type having at least one switch, and including at the switch a wipe in power chain having a wipe in pusher dog, a wipe out power chain having a wipe out pusher dog, and a free trolley having a retractable wide dog supported on a free track spaced vertically from said wipe in power chain and said wipe out power chain, the improvement comprising:

a) a cam down bar provided proximate said switch and acting on said retractable wide dog to move said retractable wide dog from a fully extended position to a cammed down position; and

b) the elevation of said wipe in power chain at said transfer portion of said power and free conveyor being sufficiently different than the elevation of said wipe out

power chain to allow said wipe in chain dog to wipe in over said retractable wide dog while said wide dog is in its cammed down position without engaging said wide dog, said wide dog moving to its fully extended position after passing out from under said cam bar.

65. The power and free conveyor system defined in claim **64**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in above said hold back dog and said retractable dog of said free trolley.

66. The power and free conveyor system defined in claim **65**, wherein;

a) said retractable dog is a multi-position retractable wide dog having
i) a fully extended position,
ii) a cammed down position, and
iii) a fully retracted position.

67. The power and free conveyor system defined in claim **66**, wherein;

a) said retractable wide dog is guided within said free trolley by
i) a front force guide roll, and
ii) a rear force guide roll.

68. The power and free conveyor system defined in claim **67**, wherein;

a) said retractable wide dog is held in said fully extended position by a counterweight connected thereto.

69. The power and free conveyor system defined in claim **68**, wherein;

a) said counterweight allows said retractable wide dog to have a stroke of at least approximately 1⅝".

70. The power and free conveyor system defined in claim **69**, wherein;

a) said holdback dog includes an actuation flange.

71. The power and free conveyor system defined in claim **64**, wherein said power and free conveyor system is an inverted power and free conveyor system and said wipe in power trolley track and said wipe out power trolley track are spaced below said free trolley track.

72. The power and free conveyor system defined in claim **71**, wherein said free trolley includes a hold back dog in addition to said retractable dog, and;

a) said wipe in power trolley track is positioned such that said wipe in power dog wipes in below said hold back dog and said retractable dog of said free trolley.

73. The power and free conveyor system defined in claim **72**, wherein;

a) said retractable dog is a multi-position retractable wide dog having
i) a fully extended position,
ii) a cammed down position, and
iii) a fully retracted position.

74. The power and free conveyor system defined in claim **73**, wherein;

a) said retractable wide dog is guided within said free trolley by
i) a front force guide roll, and
ii) a rear force guide roll.

75. The power and free conveyor system defined in claim **74**, wherein;

a) said retractable wide dog has a predetermined weight for maintaining itself in a normally fully extended position.

76. A method of transferring a free trolley from engagement with a wipe out power dog in a power and free conveyor system to a wipe in power dog without jamming conditions said method including the steps of:

a) providing a cammed down bar proximate the point of transfer to move a retractable dog on said free trolley to a cammed down position while;

b) providing that the wipe in power chain is at a position higher than the wipe out power chain for at least the zone where lateral interference between the wipe in power chain and the retractable dog could occur; and

c) returning the elevation of the wipe in power chain to the elevation of the wipe out power chain after the interference zone.

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